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THE PREMIER 100

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COMPUTERWORLD
THE PREMIER 100

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Is there a stir going on among your corporate computer systems?

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Save your precious time and resources with AT&T's revolutionary Information Systems Network (ISN). It's designed to solve your communications problems today – and tomorrow. AT&T's ISN is based on standards.

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■ **Speed/ports:** 8.64 Mbps backplane, 48,000 packets per second, 2500 virtual circuits per node.

■ **Access Method:** Perfect scheduling.

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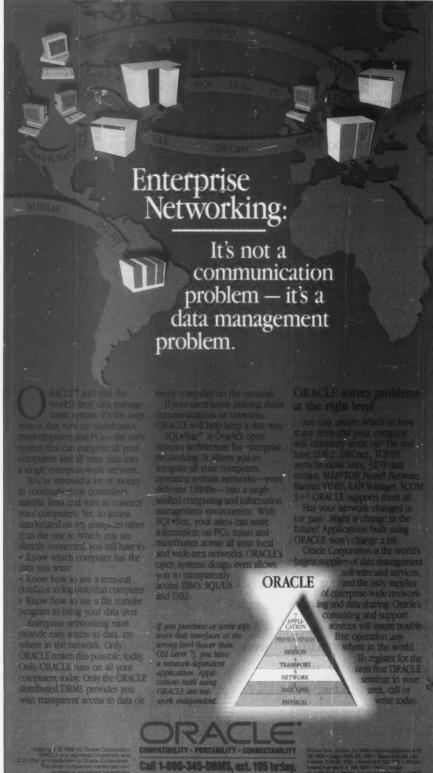
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ISN offers superior price/performance and investment protection in a multi-vendor environment. With ISN, you can base your computer purchases on your vision of the future – not fear of the future.

If your company plans include strategic use of information in a multi-vendor environment, contact your AT&T Account Executive, Authorized AT&T Reseller, or call 1 800 247-1212, Ext. 756. From equipment to networking, from computers to communications, AT&T is the right choice.

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EDITORIAL

Occasionally in life, bigger is better. This is not necessarily the case when one tries to measure the effectiveness of a company's total investment in information systems. For example, how prudent is it to spend $5 million developing software internally when wholly adequate off-the-shelf packages might be available at half the cost?

It is for this reason that we feel particularly proud of the pioneering work we've done with the *Computerworld Premier 100* in seeking a valid measurement of information systems effectiveness. And sheer size of the total systems investment is but one of our criteria of this measurement.

Consider that the most compute-intensive business arena in the U.S. is the financial and banking sector. Yet companies in this sector do not dominate the Premier 100 — far from it. We find a mid-size utility firm leading the pack, with insurance, aerospace and manufacturing firms heavily represented on the list.

Clearly, bigger is not necessarily better in terms of measuring the overall effectiveness of systems investments. In some cases, it's merely bigger, and that means more costly and less efficient than it should be.

We are living in times when the ability of a company to leverage its MIS strategy to gain a competitive edge is becoming increasingly vital. And we will soon enter an era when the ability to do this will become absolutely essential to survive and prosper.

That is precisely why information systems managers must meet the cost-benefit gorilla head-on. It is also why a penny earned on enhanced systems efficiency can end up as two pennies on the company's bottom line.

We doff our caps to the companies of the Premier 100, as well as to those listed as headlining their respective vertical industries. They serve as models for firms of all sizes struggling to grab the golden ring of competitive advantage in a fiercely competitive world economy.

Bill Laberis

BILL LABERIS
Editor in Chief

P. CHARLES LADOUCEUR

Imagine spending $160 billion and not being able to account for it in any hard and fast manner.

That is the dilemma facing U.S. companies, which will spend that much in 1988 on information technology.

To provide systems executives with answers when their bosses come calling, we conducted a monumental, yearlong effort to measure how effectively organizations are investing in computer systems.

This information-packed magazine is the result of that effort. Containing exclusive rankings of 100 American corporations, the *Computerworld Premier 100* represents the first analysis of information systems' effectiveness.

We provide revealing data on how well companies are currently investing in information systems compared with their direct competitors. Budget figures, estimated market value data, training expenditures and personnel costs are all critical factors to information systems success. We use all of these factors to rank the companies, and we report on all of them in detail.

To gather the data — which has not been published anywhere before — we contacted hundreds of information systems executives in the largest corporations in 20 industries. We made more than 2,000 phone calls to reach the right people in the labyrinths of corporate America.

Many executives, looking for ways in which to measure themselves against competitors, willingly agreed to participate. The most difficult question we asked concerned the current market value of major systems. This particular request was frequently greeted with "Oh my God!" or a huge sigh and silent pondering.

This report sets a landmark in measuring computer systems' effectiveness. The following pages contain surprises, nuances and expected results. We trust you will find them very useful when the CEO drops by for a visit.

Mike Sullivan-Trainor

MICHAEL L. SULLIVAN-TRAINOR
Special Projects Editor

LEADERSHIP SHIFTS TO SMALLER COMPANIES

By Michael Sullivan-Trainor

nformation systems executives are now learning what David taught Goliath a few thousand years ago: You don't need to be the biggest to wield a strategic advantage.
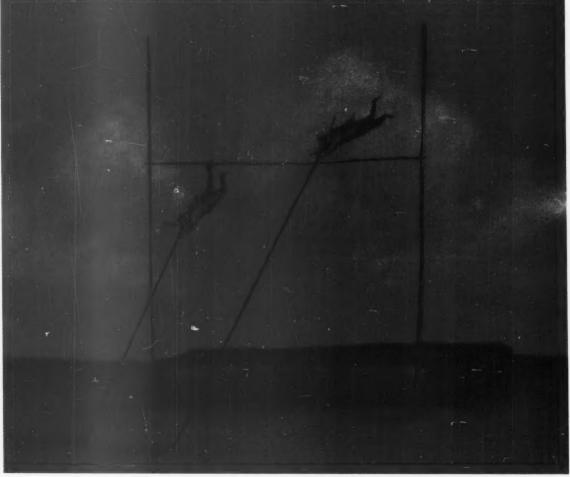
So it is that the most effective users of information systems are not the largest U.S. corporations, according to the *Computerworld Premier 100*.

The leaders in each industry rank at the top because they demonstrate a strong commitment to the factors that spell information systems success — investments in leading-edge systems that exceed those of their direct competitors; contributions to profit growth through applying systems to business needs; staffing with sufficient personnel without overspending; training systems professionals in new methods and technologies; and providing access to technology to users throughout the company.

Besides fitting this profile, the companies listed in the Premier 100 also share a common philosophy. Their strategies are aimed at developing competitive systems to capture greater market share.

"Technology is an equalizer," says Ted

MARK HEMPSTEAD

Freiser, president of John Diebold and Associates in New York. "Large companies used to overpower everyone by making the cost of entering a market very high. Technology is now allowing smaller companies to compete very effectively."

According to Melvin Berkstein, head of Arthur Andersen's technology consulting practice, companies achieve competitive advantage through technology in two primary ways:

• By using systems to differentiate their products and services from competitors', most often through front-end marketing systems and databases.

• By applying automation to become the low-cost producer within an industry.

For example, Banc One, the No. 1 bank on the Premier 100 roster, is distinguishing its services from larger competitors' by implementing distributed applications that allow account representatives to meet all customer needs directly using personal computers, rather than depending on a central system.

By establishing a credit card network — part of a corporatewide network — top retailer J. C. Penney is creating new business through technology. In addition, to further differentiate itself from other companies, Penney runs a subsidiary whose mission is to add other stores and service stations to the network.

Northeast Utilities, the No. 1 corporation overall, is applying a powerful set of the latest technologies to keep costs down, including an ISDN network and beta-test applications.

In the business mainstream

Another common theme among the companies in the Premier 100 is the recognition of the need to integrate information technology with business strategy.

Identifying where systems can best be applied to business needs is not a task for information systems alone. "Early on, we learned that using technology for competitive advantage has a high payoff," says Freiser. "However, identifying the payoff opportunities is not something information systems can do. The direction has to come from line management."

At Dow Chemical, the top chemical company, information systems is moving from a function under manufacturing and engineering to the corporate level, and the organization will play an increasingly greater role in business planning.

Despite the emphasis on competitive ad-

vantage, many companies are also struggling with the need to contain costs.

"After the turmoil of Black Monday and continued mergers and consolidations within major industries, many companies are withholding long-range information systems investments," says Jerry Kanter, director of the Center for Information Management Studies at Babson College in Wellesley, Mass. "It is difficult to justify systems investments anyway — many managers went on faith. That faith is slipping away."

Few industries are facing greater pressure to control costs than the oil industry. In the face of economic pressures, Amoco, the No. 1 petroleum products company, sees systems as tools to create more efficient operations rather than as overhead to be cut back. Downsizing within Amoco's business units is increasing the demand for computer support.

Generally, according to Diebold's Freiser, service companies are better at recognizing the relevance of technology to meeting business needs. "The insurance industry creates products using technology — new types of policies and services," he says. "Without technology these things could not be offered."

At Travelers, the top insurance and financial services company among the 100, this benefit is well-recognized. Chairman Edward H. Budd sets technology implementation in key business areas as the No. 1 corporate goal. Past the stage at which automation of manual functions was required, Travelers assigns information systems staff to business areas to encourage the creation of competitive products.

"There is no question achieving competitive advantage through technology is on lots of people's minds — line managers and senior executives have heard about it," says Babson's Kantor. "The key to it is looking at where investments are being made not just how much."

Amounts being spent for information systems are only relevant in the context of a company's revenue and its competitors'. The corporation's total profitability must also be taken into account.

Other factors that are important to measure include training and personnel expenses, the currency of equipment in use and how much access users have to the technology. The Premier 100 assesses these factors to reveal who are the current leaders of the information systems charge.

UTILITIES TOP ALL INDUSTRIES IN 100

The Premier 100 shows that the biggest spenders on technology are not necessarily the most effective users.

Banks, which spend the most — an average of 4.9% of revenue — rank in the middle of the pack — two such companies scored in the top 30, with the remaining seven falling below 50.

An industry that keeps a low profile in general and in technology use in particular — utilities — did the best, with the No. 1 firm overall and four in the top 10. Of the 13 Premier 100 finishers in the utilities category, eight are in the top 30.

Just awakening to the value of information systems, retailers scored the worst among the 100. Of the three retailers listed, none ranked among the top 50.

Continued economic struggles in the oil patch lowered the chances for petroleum products companies to rise high among the 100. Of the seven petroleum organizations on the list, only two ranked

in the top 50. Notably low in the rankings are giants Exxon (117) and Mobil (131), both of which spend a half a billion dollars or more on information systems.

Manufacturing companies scored well overall, with four in the top 10. However, the Big Three automotive manufacturers did not fare well; General Motors, which has an estimated systems budget of $2.8 billion, ranked 13th in its industry and 96th overall. Ford wound up 86th on the list, while Chrysler ranked 139th overall.

The transportation and communication services companies pushed two representatives into the top 20, but the remainder placed below 50. With the lowest average market value for major processors, the services companies own the most personal computers and terminals per employee.

Chemical companies and insurance and financial services all placed one or two finishers somewhere near the top.

HOW WE RANKED THE 100

Knowing how much a company spends on information systems is not enough to determine how well it is spending its money. The *Computerworld Premier 100* goes beyond bulk spending to objectively evaluate the most effective users of information systems.

The criteria, developed after consultation with leading industry experts, take into account current methods of determining systems effectiveness.

Six critical factors are examined to rank each company. These factors are then ranked, and the ranks are multiplied by a weighted factor to determine the final score. All the scores are added together for a total point value.

Estimated annual information systems budget as a percentage of revenue receives the heaviest weight — 30 points. Prior to ranking, the budget percentage is compared with an industry av-

erage budget as a percentage of revenue. Companies above the average receive more points than those below.

Another vital indication of systems use is the current market value of installed computer equipment. Companies today are able to obtain more power for the dollar, but a lack of new systems will eventually take its toll on efficiency. The ability to stay up to speed with technological changes also signifies company commitment. A weighted factor of 15 is applied to this criterion.

Information systems is, at least in part, responsible for maintaining profitability. The third criterion addresses this fact by measuring profitability during the past five years. Firms showing losses during the period get no points for the category, which carries a 15-point weight.

Managing staff costs is as important as investing in equipment. With more ef-

fective ways to run systems organizations with fewer people, companies are holding the line on staff spending. Firms that spend a lower percentage of their systems budget on personnel receive more points for this criterion, which receives a 10-point weight.

But keeping a streamlined staff well trained is also key to making effective use of technology. The more a firm spends on training as a percentage of the information systems budget, the more points it receives in this category. Fifteen points are assigned as a weight here.

Finally, providing user access to technology is very important in both supporting information systems within the company and in how well companies are able to implement strategic systems. The number of terminals and PCs as a percentage of total company employees is the sixth criteria, with a weight of 15.

THE 100 MOST EFFECTIVE USERS OF INFORMATION SYSTEMS

RANK	COMPANY/IS EXECUTIVE	INDUSTRY	IND. RANK	TOTAL SCORE	ESTIMATED IS BUDGET (MILLIONS)	BUDGET % REVENUE
1	Northeast Utilities Tod O. Dixon, V.P.	Utilities	1	15,320	$75	3.60
2	Polaroid Corp. Albert L. Hyland, Dir.	Equip./Mater. manuf.	1	14,905	$75	4.25
3	Northrop Corp. W. Richard Howard, V.P.	Aero./Auto./Indust. manuf.	1	14,800	$300	4.90
4	The Travelers Corp. Lawrence A. Bacon, Sr. V.P.	Ins./Finan. services	1	14,600	$350	9.14
5	Southwestern Bell Corp. Kenneth R. Bender, V.P.	Utilities	2	14,135	$339	4.23
6	Gillette Co. None currently	Equip./Mater. manuf.	2	13,960	$80	2.52
7	Abbott Laboratories Kenneth Farmer, V.P.	Food/Consumer prods.	1	13,925	$125	2.84
8	Bell Atlantic Corp. Joseph Ambrozy, V.P.	Utilities	3	13,905	$325	3.15
9	McDonnell Douglas Corp. Ernie H. Ridenhour, V.P.	Aero./Auto./Indust. manuf.	2	13,885	$550	4.18
10	MCI Communications Corp. Allan Ditchfield, Sr. V.P.	Utilities	4	13,745	$175	4.44
11	Baxter Healthcare Corp. Michael S. Heschel, Corp. V.P.	Food/Consumer prods.	2	13,725	$160	2.57
12	McGraw-Hill, Inc.* Richard H. Shriver, Sr. V.P.	Trans./Commun./Other serv.	1	13,295	$125	7.13
13	Dow Chemical Co. Hans Huppertz, Dir.	Chemicals	1	13,215	$250	1.86
14	The Lockheed Corp. Dean Allen, V.P.	Aero./Auto./Indust. manuf.	3	13,195	$400	3.51
15	Owens-Illinois, Inc. Ray Davis, Mgr.	Equip./Mater. manuf.	3	13,045	$65	1.74
16	The Mead Corp. John K. Langenbahn, V.P.	Equip./Mater. manuf.	4	12,910	$50	1.18
17	AT&T* William Garrett, V.P.	Utilities	5	12,760	$600	1.78
18	AMR (American Airlines) Max Hopper, Sr. V.P.	Trans./Commun./Other serv.	2	12,720	$400	5.55
19	Eastman Kodak Co.* Katherine M. Hudson, Dir.	Equip./Mater. manuf.	5	12,655	$266	1.99
20	GTE Corp. Dennis Murphy, Dir.	Utilities	6	12,625	$525	3.40
21	Merck & Co.* Albert C. Cinorre, V.P.	Food/Consumer prods.	3	12,535	$150	2.96
22	Texas Utilities Co. H. B. Keating, Dir.	Utilities	7	12,455	$113	2.76
23	New York Life Insurance Co. Michael J. McLaughlin, Sr. V.P.	Ins./Finan. services	2	12,410	$125	2.23
24	Banc One Corp. David M. Van Lear, Pres., Banc One Serv.	Banking	1	12,400	$150	7.65
25	Gencorp, Inc. Linda George, Dir.	Equip./Mater. manuf.	6	12,385	$40	1.28

*Estimates are from *Computerworld* sources, not from the company.

ESTIMATED VALUE (MILLIONS)	VALUE % REVENUE	% BUDGET STAFF	% BUDGET TRAINING	TOTAL PCS & TERMINALS	% PC/TERMINAL PER EMPLOYEE	RANK
$125	6.00	34	5	4,110	44.19	1
$75	4.25	40	1	4,500	32.93	2
$125	2.06	55	5	20,000	42.10	3
$100	2.61	50	7	30,000	88.49	4
$197	2.46	50	2	55,000	81.72	5
$80	2.52	35	5	6,500	21.59	6
$125	2.84	34	6	14,000	38.04	7
$455	4.41	49	2	49,000	60.79	8
$450	3.42	47	3	50,000	45.87	9
$125	3.17	50	6	10,000	71.94	10
$50	.80	33	5	25,000	40.00	11
$125	7.13	50	5	3,000	19.23	12
$100	.74	33	5	25,000	47.89	13
$200	1.75	35	5	30,000	30.58	14
$100	2.69	25	5	8,000	17.71	15
$130	3.08	35	5	5,000	24.27	16
$600	1.78	40	5	89,000	28.70	17
$80	1.11	30	3	100,000	167.50	18
$100	.75	35	5	55,000	44.75	19
$275	1.78	35	5	63,000	39.13	20
$100	1.97	40	3	5,000	16.07	21
$35	.85	22	1	5,800	35.15	22
$52	.92	46	3	8,000	40.51	23
$50	2.55	35	5	300	2.25	24
$15	.48	50	10	3,000	21.2	25

THE 100 MOST EFFECTIVE USERS OF INFORMATION SYSTEMS

RANK	COMPANY/IS EXECUTIVE	INDUSTRY	IND. RANK	TOTAL SCORE	ESTIMATED IS BUDGET (MILLIONS)	BUDGET % REVENUE
26	International Paper Co.* Gerhard Seblatnigg, Dir.	Equip./Mater. manuf.	7	12,370	$100	1.28
27	Goodyear Tire & Rubber Co. Joseph H. Gilchrist, Ast. Comp.	Equip./Mater. manuf.	8	12,285	$140	1.38
28	Contel Corp. Kenneth Bottonari, V.P.	Utilities	8	12,065	$150	5.16
29	Norwest Corp. John Geiken, Grp. Mgr.	Banking	2	11,975	$110	4.78
30	Nationwide Mutual Ins. Co.* Daniel M. Fullerton, V.P.	Ins./Finan. services	3	11,935	$130	1.87
31	Textron, Inc. Cecil W. Labhart, Dir.	Aero./Auto./Indust. manuf.	4	11,865	$150	2.64
32	Deere & Co. Robert Bulen, Dir.	Aero./Auto./Indust. manuf.	5	11,840	$140	3.38
33	General Signal Corp. Stefan Gladyszewski, Ast. Comp.	Equip./Mater. manuf.	9	11,830	$50	3.1
34	Rockwell International Corp. James F. Sutter, Dir.	Aero./Auto./Indust. manuf.	6	11,825	$450	3.71
35	Georgia-Pacific Corp.* Fred Radford, Dir.	Equip./Mater. manuf.	10	11,710	$150	1.74
36	Pfizer, Inc. William Mullin, V.P.	Food/Consumer prods.	4	11,700	$125	2.54
37	American Cyanamid Co. Edward A. Lustig, Corp. Dir.	Chemicals	2	11,690	$75	1.80
38	General Electric Co. Edward J. Sikko, V.P.	Equip./Mater. manuf.	11	11,650	$1,100	2.79
39	Smith Kline Beckman Corp. John Blood, Sup.	Food/Consumer prods.	5	11,605	$175	4.04
40	Amoco Corp.* John R. Reid, Gen. Mgr.	Petroleum products	1	11,515	$200	.99
41	Caterpillar, Inc. Dale L. Fieldcamp, Mgr.	Aero./Auto./Indust. manuf.	7	11,450‡	$140	1.71
42	Corning Glass Works Harvey R. Shrednick, V.P.	Equip./Mater. manuf.	12	11,450‡	$30	1.43
43	Metropolitan Life Ins. Co. Daniel J. Cavanaugh, Sr. V.P.	Ins./Finan. services	4	11,380	$225	1.61
44	United Technologies Corp.* Roger Brady, Corp. Mgr.	Aero./Auto./Indust. manuf.	8	11,365	$300	1.74
45	Teachers Ins. & Annuity Assn. John A. Putney Jr., Exec. V.P.	Ins./Finan. services	5	11,345	$56	1.83
46	Bankamerica Corp.* Michael Simmons, Exec. V.P.	Banking	3	11,275	$500	5.12
47	Southern Company Services, Inc. M. Eul Wade Jr., Sr. V.P.	Utilities	9	11,270	$125	1.78
48	Unocal Corp.* Gordon Dolfie, Dir.	Petroleum products	2	11,205	$125	1.47
49	Corestates Financial Corp. Bipin C. Shah, Vice Chair.	Banking	4	11,160	$60	4.14
50	Sara Lee Corp. Vincent H. Swoyer, V.P.	Food/Consumer prods.	6	11,095	$250	2.73

*Estimates are from *Computerworld* sources, not from the company.

‡In the case of ties in total score, rankings were determined by analyzing additional financial data.

ESTIMATED VALUE (MILLIONS)	VALUE % REVENUE	% BUDGET STAFF	% BUDGET TRAINING	TOTAL PCS & TERMINALS	% PC/TERMINAL PER EMPLOYEE	RANK
$150	1.93	35	5	10,000	21.97	26
$125	1.23	36	1	22,000	19.18	27
$50	1.72	50	3	5,000	22.32	28
$120	5.22	31	2	14,000	88.05	29
$80	1.15	70	5	5,000	41.66	30
$50	.88	45	1	10,000	15.03	31
$53	1.28	54	3	11,000	29.02	32
$50	.62	23	2	8,000	41.58	33
$48	.39	34	2	30,000	25.27	34
$100	1.16	35	5	4,000	9.52	35
$125	2.54	45	3	5,000	12.28	36
$125	3.00	38	5	5,000	14.59	37
$200	.50	32	2	99,000	29.95	38
$30	.69	35	5	7,500	21.42	39
$100	.49	40	5	15,000	32.05	40
$200	2.44	60	4	18,000	33.45	41
$15	.71	39	3	6,000	22.90	42
$158	1.13	40	2	24,000	63.15	43
$216	1.25	40	5	30,500	15.90	44
$2	.06	54	1	3,500	114.19	45
$100	1.03	35	5	30,000	46.88	46
$125	1.78	31	1	12,000	37.73	47
$100	1.18	30	2	6,000	33.14	48
$50	3.45	30	1	5,000	64.93	49
$125	1.36	40	5	6,000	6.68	50

THE 100 MOST EFFECTIVE USERS OF INFORMATION SYSTEMS

RANK	COMPANY/IS EXECUTIVE	INDUSTRY	IND. RANK	TOTAL SCORE	ESTIMATED IS BUDGET (MILLIONS)	BUDGET % REVENUE	
51	American Express Co.* None currently	Ins./Finan. services	6	11,080	$800	4.5	
52	E.I. Du Pont De Nemours and Co. Raymond E. Cairns Jr., V.P.	Chemicals	3	11,030	$775	2.54	
53	Wickes Companies William Mann, V.P.	Equip./Mater. manuf.	13	11,025	$100	2.87	
54	Citicorp* James Banbury, V.P.	Banking	5	11,020‡	$1,500	5.40	
55	Middle South Utilities, Inc.* Robert DeLoach, V.P.	Utilities	10	11,020‡	$45	1.30	
56	USX Corp. J. R. McAfee, Mgr.	Petroleum products	3	11,010	$175	1.25	
57	First Union Corp. Charles G. Klapheke, Sr. V.P.	Banking	6	10,975	$120	4.56	
58	CBS, Inc.* Peter J. Schementi, V.P.	Trans./Commun./Other serv.	3	10,915	$40	1.44	
59	Monsanto Co.* Leonard A. Cohn, V.P.	Chemicals	4	10,890	$160	2.09	
60	Time, Inc.* James Mussallem, Dir.	Trans./Commun./Other serv.	4	10,885	$60	1.43	
61	Federal Express Corp. Ron J. Ponder, Sr. V.P.	Trans./Commun./Other serv.	5	10,840‡	$190	5.39	
62	Reynolds Metals Co. James T. Matsey, Corp. Dir.	Equip./Mater. manuf.	14	10,840‡	$75	1.75	
63	Dun & Bradstreet Corp.* Walter Peitz, Exec. V.P.	Trans./Commun./Other serv.	6	10,830‡	$50	1.48	
64	Sun Co. Dudley P. Cooke, Gen. Mgr.	Petroleum products	4	10,830‡	$125	1.43	
65	Primerica Corp. Thomas R. Gaughan, V.P.	Ins./Finan. services	7	10,820	$120	3.18	
66	Duke Power Co. George E. Stubbins, V.P.	Utilities	11	10,770	$70	1.88	
67	J. C. Penney Co. David Evans, Dir.	Retailing	1	10,705	$225	1.46	
68	Mutual Benefit Life Ins. Co. Charles G. McCaig, Sr. V.P.	Ins./Finan. services	8	10,700	$45	2.24	
69	Union Carbide Corp. T. B. Smith, Mgr.	Chemicals	5	10,675	$125	1.80	
70	Home Federal Savings & Loan Edwin R. Nichols, CIO	Banking	7	10,650‡	$52	4.13	
71	Johnson & Johnson* Raymond Giovannelli, V.P.	Food/Consumer prods.	7	10,650‡	$200	2.49	
72	First Chicago Corp.* Peter Miller, Sr. V.P.	Banking	8	10,600‡	$200	4.71	
73	Pennzoil Co. Patrick L. Manning, Pres.	Petroleum products	5	10,600‡	$33	1.84	
74	Sears Roebuck and Co. Charles Moran, Sr. V.P. & CIO.	Retailing	2	10,510	$600	1.23	
75	RJR Nabisco, Inc.* Thomas Zoeller, V.P.	Food/Consumer prods.	8	10,485	$240	1.51	

*Estimates are from *Computerworld* sources, not from the company.

‡In the case of ties in total score, rankings were determined by analyzing additional financial data.

ESTIMATED VALUE (MILLIONS)	VALUE % REVENUE	% BUDGET STAFF	% BUDGET TRAINING	TOTAL PCS & TERMINALS	% PC/TERMINAL PER EMPLOYEE	RANK
$400	2.25	40	4	40,000	49.07	51
$140	.45	50	7	25,000	17.76	52
$200	5.75	38.2	2	5,000	8.33	53
$400	1.45	35	5	20,000	22.39	54
$30	.86	48	2	10,000	72.99	55
$200	1.43	33	2	20,000	37.38	56
$14	.51	18	1	8,000	40.40	57
$20	.72	35	5	3,000	43.47	58
$130	1.70	30	2	10,000	19.72	59
$53	1.26	40	2	4,500	83.33	60
$50	1.41	35	2	10,000	21.59	61
$125	2.91	35	5	6,200	22.71	62
$100	2.97	45	5	10,000	16.94	63
$100	1.15	33	5	6,000	25.97	64
$60	1.59	45	1	5,000	20.16	65
$30	.80	20	3	6,275	30.75	66
$75	.48	35	5	80,000	44.81	67
$7	.35	54	2	34,000	100	68
$175	2.53	35	3	8,000	18.55	69
$13	1.03	30	7	2,800	71.79	70
$60	.74	45	5	20,000	2.57	71
$50	1.17	47	5	10,000	72.99	72
$12	.67	38	1.2	1,725	27.82	73
$750	1.54	18	2	140,000	28.38	74
$60	.37	45	5	50,000	41.55	75

THE 100 MOST EFFECTIVE USERS OF INFORMATION SYSTEMS

RANK	COMPANY/IS EXECUTIVE	INDUSTRY	IND. RANK	TOTAL SCORE	ESTIMATED IS BUDGET (MILLIONS)	BUDGET % REVENUE
76	Carter Hawley Hale Stores, Inc.* Paul Burrows, V.P.	Retailing	3	10,465	$40	1.51
77	Burlington Industries, Inc. E. Ritchie Fishburne, Dir.	Equip./Mater. manuf.	15	10,460	$50	1.52
78	Minnesota Mining & Mfg. Co. Donald Siegfried, Exec. Dir.	Equip./Mater. manuf.	16	10,440	$140	1.48
79	Pepsico, Inc. Allan B. Deering, V.P.	Food/Consumer prods.	9	10,410‡	$250	2.17
80	St. Paul Companies, Inc.* Gary Hanson, V.P.	Ins./Finan. services	9	10,410‡	$105	3.11
81	Bellsouth Corp.* Preston Williamson, Ast. V.P.	Utilities	12	10,405‡	$160	1.30
82	Farmers Group, Inc. Edward A. Terhar, V.P.	Ins./Finan. services	10	10,405‡	$75	1.18
83	Atlantic Richfield Co. Allen N. Smith, Mgr.	Petroleum products	6	10,385	$240	1.47
84	The Coca-Cola Co.* Hugh Switzar, V.P.	Food/Consumer prods.	10	10,375	$100	1.30
85	Manufacturers Hanover Corp. H. Edward Nyce, Exec. V.P.	Banking	9	10,350	$380	4.89
86	Ford Motor Co. S. I. Gilman, Exec. Dir.	Aero./Auto./Indust. manuf.	9	10,325	$836	1.16
87	Salomon, Inc.* David Gertier, Dir.	Ins./Finan. services	12	10,300	$186	3.09
88	Capital Cities/ABC* Teresa Lykoudis, Mgr.	Trans./Commun./Other serv.	7	10,270‡	$60	1.35
89	Teledyne, Inc.* Richard Tracy, Dir.	Equip./Mater. manuf.	17	10,270‡	$50	1.55
90	General Dynamics Corp. Asaph H. Hall, V.P.	Aero./Auto./Indust. manuf.	10	10,265	$200	2.14
91	The Boeing Co.* Carl Munson, V.P.	Aero./Auto./Indust. manuf.	11	10,240	$300	1.95
92	Pacific Gas and Electric Co. John Danielson, V.P.	Utilities	13	10,135	$125	1.73
93	American Standard, Inc. Gary J. Biddle, V.P.	Aero./Auto./Indust. manuf.	12	10,065	$53	1.54
94	PPG Industries, Inc.* Sally E. Wellinger, Corp. Dir.	Equip./Mater. manuf.	18	10,060	$40	.77
95	American International Group* Arnold Felberbaum, Sr. V.P.	Ins./Finan. services	13	10,005	$350	3.10
96	General Motors Corp.* David H. Hill, Exec.	Aero./Auto./Indust. manuf.	13	9,990	$2,880	2.82
97	First Wachovia Corp. Charles Lewis, Sr. V.P.	Banking	10	9,925‡	$50	2.78
98	Shell Oil Co. Leroy L. Drury, V.P.	Petroleum products	7	9,925‡	$200	.95
99	Litton Industries* George Repsold, Mgr.	Equip./Mater. manuf.	19	9,910	$60	1.35
100	General Mills, Inc.* Richard Dietz, V.P.	Food/Consumer prods.	11	9,900	$100	1.92

*Estimates are from *Computerworld* sources, not from the company.

‡In the case of ties in total score, rankings were determined by analyzing additional financial data.

ESTIMATED VALUE (MILLIONS)	VALUE % REVENUE	% BUDGET STAFF	% BUDGET TRAINING	TOTAL PCS & TERMINALS	% PC/TERMINAL PER EMPLOYEE	RANK
$40	1.51	35	5	10,000	28.57	76
$100	3.04	50	2	4,400	10	77
$140	1.48	41	5	27,000	32.76	78
$50	.43	52	5	5,000	2.27	79
$60	1.78	45	5	8,000	81.36	80
$274	2.23	35	5	33,000	33.74	81
$75	1.18	35	5	14,000	90.32	82
$40	.24	46	5	12,000	45.80	83
$40	.52	35	5	6,000	26.43	84
$100	1.28	45	3	10,000	33.67	85
$420	.58	34	7	80,000	22.83	86
$50	.83	40	5	6,000	75	87
$40	.90	35	5	10,000	50	88
$50	1.55	35	5	6,000	13.45	89
$200	2.14	37	1	15,000	14.23	90
$100	.65	35	5	20,000	14.69	91
$75	1.04	57	3	16,000	58.60	92
$8	.23	45	1.5	4,500	11.50	93
$70	1.35	35	5	7,000	19.02	94
$42	.37	30	2	10,000	35.71	95
$385	.37	45	5	114,000	14.01	96
$60	3.34	35	5	5,000	38.16	97
$65	.31	40	2	24,000	72.32	98
$75	1.69	40	2	10,000	18.21	99
$50	.96	45	5	4,000	6.26	100

NORTHEAST: A UTILITY'S NO. 1 STRATEGY FOR BEATING THE HEAT

By Connie Winkler

Tod Dixon, vice-president of Northeast's information resources group

The heat is on Northeast Utilities, the No. 1 company in the *Computerworld Premier 100*. Facing increased demand due to record temperatures this summer, the utility is also meeting unexpected competition from independent power producers.

"The utilities business is moving from a protected regulatory industry to a highly competitive one, and the only way to survive is to use every piece of technology available," says Tod O. Dixon, vice-president of Northeast's information resources group.

Northeast spends nearly 4% of its annual revenue on information systems to control costs and improve customer service. "Electricity is a commodity product. The only things we can compete on are price and service," Dixon says.

The utility is using computer systems in many areas to streamline power generation and improve distribution. Northeast is currently engaged in the following:

● Testing one of the largest Integrated Services Digital Network (ISDN) systems to improve its response to customers' requests.
● Acting as a beta-test site for mainframe, minicomputer and communications vendors.
● Running an adaptable internal corporatewide network, including an electronic mail system using clustered Digital Equipment Corp.'s VAXs and All-In-1 software.
● Using new technology, such as bar coding and handheld computers, to track environmental data such as low-level radioactive wastes.

The company uses computer-based technologies as much as possible, including in-process control systems at the generating plants and tracking weather and environmental conditions. The ISDN system — the first large networked system developed by Northern Telecom — will enable Northeast's customer service group to know the phone number of an incoming caller so it can improve customer service, Dixon explains.

Approximately 65% of Northeast's service calls come from a problem location. In a heat-wave outage, for instance, a prerecorded message has the ability to inform customers that the problem in their neighborhood is being fixed.

"We will handle the call in a human way without having a human involved," Dixon says. His Northern Telecom Displayphone already allows him to know who is calling from 3,000 lines within Northeast's six computer sites.

The phone number will also serve as Northeast's customer file number so that service representatives, who handle thousands of calls each day, do not need to sift through confusing account numbers or address listings. Northern Telecom was interested in using Northeast as a beta-test site because of the complexity of delivering ISDN to 12,000 lines through some 44 networked switchboards.

"We operate more interconnected PBXs than most," Dixon says in an understatement.
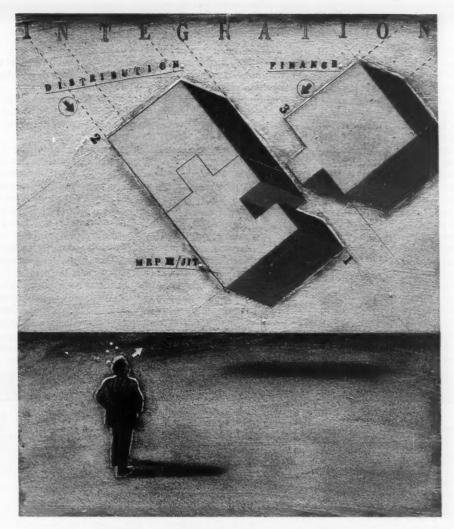
The ISDN network is operating at four locations, with all 44 scheduled to be on-line by second quarter, 1989. The next communications projects will be installing T1 trunks and fiber-optic network lines over the utility's existing rights of way. The Northern Telecom project is the latest beta test Dixon will disclose. He likes running two or three such tests at a time.

Big on beta testing

"I'm very big on beta testing," says the former industrial engineer, who found he could do a lot more engineering with computers. "But we don't do it unless there's a financial or operations benefit, allowing us to get the product sooner."

The biggest benefit of the beta projects may be on the morale of employees; they like the prestige and learning experience of working on seemingly clandestine projects with major vendors.

The utility, with its heavy nuclear engineering processing (two-thirds of its electricity comes from nuclear plants), was also a beta-test site several years ago for IBM's 3090 Model 400E with vector processing. Northeast and IBM ironed out problems in processing Northeast's program code that had initially been written for Control Data

Corp. computers, Dixon says.

While the heat wave of 1988 was unexpected, it is as if Northeast began preparing for the current power crunch back in 1983. At the urging of the company's president and Cambridge, Mass., consultancy Arthur D. Little, Inc., the utility began aggressively streamlining its two diverse computer architectures, numerous stand-alone office systems and voice/data communications.

When Dixon was brought in to carry out the project five years ago, he analyzed the end-user computing needs and found no departmental applications. So he consolidated a collection of independent personal and administrative office applications under the All-In-1 system that runs on a variety of DEC processors from a VAX-11/785 to an 8700.

Dixon decides to invest in new technol-

Dixon says "a lot more questions are being asked. We don't have the luxury of being sloppy anymore."

ogy only if he can demonstrate that it will benefit the company's bottom line. He also believes that the combination of beta tests and training investments is essential.

"We want the best people, and the only way to attract them is by providing opportunities to learn and work with the latest technology," he says.

Training, which totals about 5% of the systems budget, is one of the few areas in which cutbacks are not occurring.

According to last year's annual report, Northeast recorded "creditable though not outstanding results" — revenue of $2.08 billion and net income of $229 million. This is a major improvement over 1986, when it wrote off portions of its investment in New Hampshire's blocked Seabrook nuclear power plant.

"We're sharpening our pencils more than

we did before," Dixon says. "A lot more questions are being asked, and the questions are more complex. We don't have the luxury of being sloppy anymore."

Containing costs is a key goal of the utility, which already eliminated $59 million from 1988 operating and maintenance expenses.
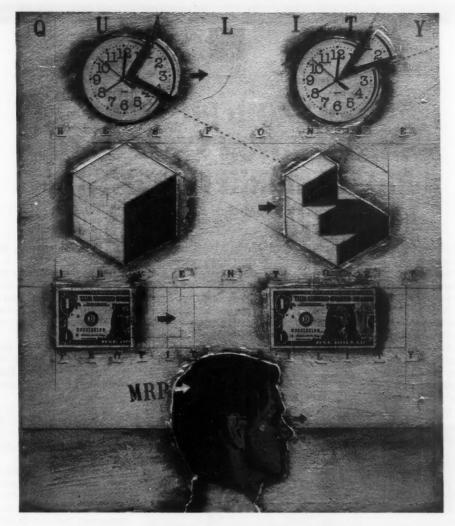
Northeast owns portions of four nuclear generating companies, so the company operates under strong environmental regulations. Low-level radioactive waste is now being marked with bar codes and tracked from cradle to grave by small 32K-byte handheld computers, Dixon says, noting these handheld computers are similar to those that Northeast's 400 meter readers already use.

The company also uses communications and computer technologies to monitor the weather and river and shore levels.

"After all, if it's cloudy, customers are going to turn on their lights," Dixon adds — to say nothing of the air conditioners.

Winkler, former New York bureau chief for Computerworld, *writes about information strategies and management technology.*

UTILITIES

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**Northeast Utilities** Hartford, Conn. 9,300	1	15,320	$2,081M	$229.1M	$75M
2	**Southwestern Bell Corp.** St. Louis 67,300	5	14,135	$8,003M	$1,047.1M	$339M
3	**Bell Atlantic Corp.** Arlington, Va. 80,600	8	13,905	$10,298M	$1,240.4M	$325M
4	**MCI Communications Corp.** Washington, D.C. 13,900	10	13,745	$3,939M	$85M	$175M
5	**AT&T** Warren, N.J. 310,000	17	12,760	$33,598M	$2,044M	$600M
6	**GTE Corp.** Stamford, Conn. 161,000	20	12,625	$15,421M	$1,118.8M	$525M
7	**Texas Utilities Co.** Dallas 16,500	22	12,455	$4,083M	$680M	$113M
8	**Contel Corp.** Atlanta 22,400	28	12,065	$2,905M	$43M	$150M
9	**Southern Company Services, Inc.** Atlanta 31,800	47	11,270	$7,010M	$554.4M	$125M
10	**Middle South Utilities, Inc.** New Orleans 13,700	55	11,020	$3,455M	$813.9M	$45M

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POLAROID PIONEERS INFORMATION SYSTEMS TO BATTLE MARKET ADVERSITY

By Michael Ball

Technology was magic when Polaroid Corp. made its name with the first instant camera. Imagine a picture on the spot, just 60 seconds after you took it!

Ever since, the company has prided itself on investments in technology. Today, the pride is still evident but the magic is gone. Competitors as close as Rochester, N.Y., and as far as Japan continue to offer breakthroughs that cut into Polaroid's profits.

One-hour photo-developing quick stops and easy-to-use 35mm cameras are cutting into Polaroid's instant photography market. So the firm is offering limited-shelf-life films and chemicals against hungry competitors.

Understandably, and successfully so far, the firm continues to turn to information systems to survive these difficulties. Polaroid ranks No. 1 among equipment and material manufacturers surveyed for the *Computerworld Premier 100* because of the company's reliance on technology. Polaroid's information systems budget totals about 4% of revenue, significantly higher than the 1.4% average for its industry. Current market value of installed systems also hovers near the 4% mark.

The corporate strategy driven by new Chief Executive Officer I. MacAllister "Mac" Booth also calls for more products and fewer employees. Through attrition and early retirement, Booth wants the company to shrink to less than half the staff of only two years ago — from 20,000 to today's 13,000 and toward 9,500.

Aside from these challenges, Polaroid is in the midst of battling a $2.28 billion takeover attempt by Shamrock Holdings, Inc., a communications company owned by the Roy E. Disney family.
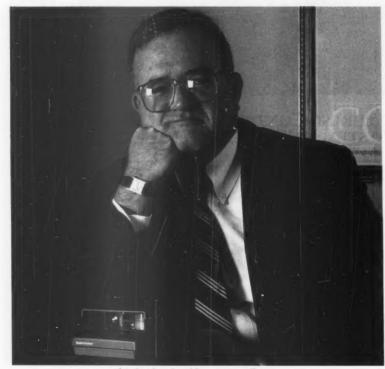
The one bright light on the corporate horizon is the likely award of $1 billion to $2 billion to Polaroid from Eastman Kodak Co. because of instant photography patent infringements.

Marshaling the information systems forces to control costs and create efficiencies throughout the company is Albert L. Hyland, director of Polaroid's worldwide systems management division at the firm's Waltham, Mass., information systems headquarters.
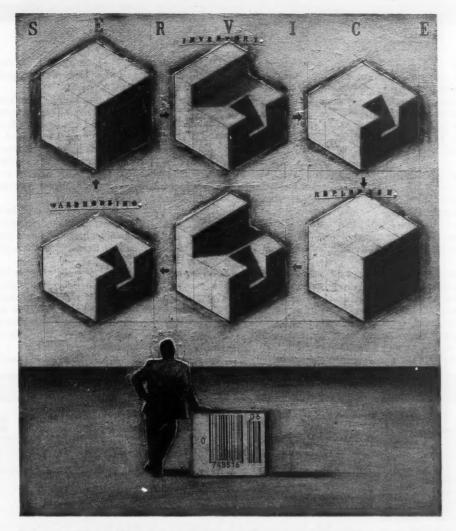
"We constantly have to find inefficiencies in production and distribution," Hyland says. "We want to service our customers more regularly, with weekly shipments in the U.S. Only knowing and forecasting what the customer wants lets us control our production and inventory costs on our end."

Polaroid has pioneered advanced distribution, forecasting and tracking systems as well as broadened its networking and workgroup computing functions, Hyland says.

The hardware to support these applications is what Hyland calls "an IBM sandwich" — three IBM mainframes (two 3081s in Waltham and a 4381 in Scotland), 150 DEC and IBM minicomputers and 4,500 IBM-compatible terminals and personal computers. These systems run from the lab with computer-aided design and manufacturing in chip and molecular design through production planning and monitoring into finance

Al Hyland, Polaroid's systems director

MARC ALCAREZ

and distribution.

Most of the software is custom or customized. Seven years ago, the company upgraded its distribution system to include new functions for on-line order entry and need allocation. These applications run domestically on two DEC VAX 8500-class machines and seven IBM 8140s in Europe feeding into the mainframes.

The company's strategy is in line with an industry trend to rely more heavily on the middle and bottom of the computer sandwich. "The centralized mainframe is being made obsolete by distributed workstation technology," says Bill Stoddard, head of Arthur Andersen & Co.'s manufacturing practice.

Advanced manufacturing forecasting and control are only possible through innovative information systems, Stoddard says, leading to a combination of just-in-time and manufacturing resources planning.

"The only way to make the product pipeline shorter is through timely information flow from vendor to wholesaler to warehouse to factory," he adds. "The old systems may have been batch-oriented and allowed plenty of time to let accounting calculate. But today's response-cycle requirements are much more demanding."

Complex pipeline

For Polaroid, the product pipeline involves more than getting film to the retailer. The dated boxes must be in precise quantities, which the company must forecast accurately. Information systems cannot depend on wholesalers, because it bases its expensive inventory and production on the figures.

"Only knowing exactly what customers will need lets us control costs," Hyland says.

Despite its strategic importance, information systems will not be immune from corporate change. "Obviously, we will lose some in MIS," Hyland says. "Some of the older managers will retire, and some of the younger, nervous people will pick up the phone and call headhunters."

However, Hyland sees the biggest crunch coming from the main organization. "There will be fewer people throughout the company, which will mean more requests for MIS," he says.

To make sure his staff understands a variety of information systems in operation, Hyland moves them around. "We move people all over, from research and engineering through manufacturing and the classic business applications," he says. "We build skills and depth. They have to be reasonably knowledgeable, though not experts, even in the technical areas."

Hyland sees this need becoming even more important as the company shrinks staff and heads toward a future of products based on new technologies, such as electronic imaging.

Polaroid hopes to revive interest in instant photography by introducing a new generation of products, which combine electronics with the use of heat to develop film. Perhaps the mixture of microprocessors and imaging systems will help the company rediscover some of its magic.

Ball is a free-lance writer based in Boston.

EQUIPMENT AND MATERIALS MANUFACTURING

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	Polaroid Corp. Cambridge, Mass. 13,662	2	14,905	$1,764M	$116M	$75M
2	Gillette Co. Boston 30,100	6	13,960	$3,167M	$230M	$80M
3	Owens-Illinois, Inc. Toledo, Ohio 45,166	15	13,045	$3,715M	$179M	$65M
4	The Mead Corp. Dayton, Ohio 20,600	16	12,910	$4,208.8M	$217.7M	$50M
5	Eastman Kodak Co. Rochester, N.Y. 122,900	19	12,655	$13,305M	$1,178M	$266M
6	Gencorp, Inc. Akron, Ohio 14,100	25	12,385	$3,101M	$475M	$40M
7	International Paper Co. Purchase, N.Y. 45,500	26	12,370	$7,763M	$407M	$100M
8	Goodyear Tire & Rubber Co. Akron, Ohio 114,700	27	12,285	$10,123.2M	$770.9M	$140M
9	General Signal Corp. Stamford, Conn. 19,126	33	11,830	$1,603M	$69M	$50M
10	Georgia-Pacific Corp. Atlanta 42,000	35	11,710	$8,603M	$458M	$150M

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NORTHROP DESIGNS OWN SYSTEMS TO ANSWER PRESSURE TO INTEGRATE

By Glenn Rifkin

Despite earning the top spot in the aerospace, automotive and industrial segment of the Premier 100, Northrop Corp. is not interested in creating a business out of information systems, as some competitors have.

"Our job is to build aircraft," says W. Richard Howard, vice-president of information resource management.

To that end, the $6 billion defense contractor is focusing attention on using systems to better integrate its engineering and manufacturing capabilities. In a company whose lifeblood is technology, Howard's group faces intense pressure to integrate what is commercially available and build what is not.

Recent troubles at Northrop exacerbate that pressure. Plagued by production problems in its MX Peacekeeper missile guidance systems development and charges of cost overruns in its B2 Stealth bomber program, Northrop is intent on using technology to get product design and manufacturing functioning at its peak.

Howard, who oversees 3,000 systems professionals in the Los Angeles-based company, points out that information systems at Northrop goes far beyond the traditional data processing function. "Information

Richard Howard, Northrop's vice-president of information resource management

resource management in this world is not DP or MIS; it really focuses on what we are doing with technology throughout the company."

Northrop spends an estimated $300 million annually on information systems, 55% of it directly on staff. Northrop has invested more than $2.5 billion in facilities and equipment since 1980, refocusing its resources to position the company for the 1990s.

Howard, who joined Northrop five years ago, is working on a goal set 10 years ago by the company: to design strictly in a three-dimensional computer database.

As a leading design engineering company, Northrop realized it could significantly improve its quality and output by moving to sophisticated 3-D engineering workstations.

Ten years ago, however, there were no 3-D workstations to buy, so Northrop developed a system internally. The first product designed by the new system was the B2 bomber, the first aircraft in history designed totally in 3-D.

Under Howard's guidance, the system went a step further, moving the 3-D capabilities through the manufacturing process and finally into the logistics and support operations. Because of the 3-D capability, Northrop was able to put all its critical processes — design, production planning, fabrication, quality inspection and assembly — on a common database, thus increasing quality and productivity.

In the system's hands

"An airplane is nothing but a bunch of complex surfaces," Howard says. "The key element is the production. If you can do the form and fit on the computer, you don't have to do it manually.

"In the past, the engineer couldn't know something was wrong until he started to build a mock-up. Now the system tells him if he is doing something wrong during the design stage."

At Northrop, people no longer say "back to the drawing board" because they stopped designing on drawing boards in 1984.

Northrop uses the 3-D system, based on IBM mainframes and different types of computer-aided design workstations, on the new Advanced Tactical Fighter project as well. Howard acknowledges that such a system gives Northrop a decided strategic advantage. The company has struggled with the question of whether to offer the 3-D technology for sale in the commercial marketplace.

Several automakers who "would like to get their hands on the system" have approached Northrop, and one organization offered to go out and sell it for the company. After intense internal debate, the decision was made to keep the technology in-house.

Howard instead is focusing on a bigger priority: linking the enterprisewide network together. At Northrop, that means tying design to production and then to logistics and support. Office and administrative computing is considered almost a secondary support function, according to Howard.

An IBM Systems Network Architecture network hooks together most of Northrop's 20,000 personal computers and terminals. While the mainframes are the backbone of the network, Northrop uses equipment from a myriad of suppliers, including HP and DEC. "We face the classic challenge," Howard says. "and that's to get the vendors to help us solve the problems they've created for us."

In Northrop's distributed environment — there are 24 sites worldwide — the problem is acute. Howard purposely keeps the headquarters staff small. Seventy-five people support the corporate data center. There are 25 director-level executives who essentially manage no one — they are, as Howard describes them, "isolated along functional lines." Their job is to help the divisions develop systems plans.

The directors come from varied disciplines rather than traditional MIS backgrounds.

Howard is quick to point out that despite the decentralized nature of Northrop's information systems function, his group still works as a team. "We find those people with the need and set up cross-divisional teams. We coordinate our efforts so we are not constantly reinventing the wheel," he says.

Tying the entire corporation together is simply not possible. Certain areas are classified and must operate in autonomous, highly secure environments.

Also, Howard says, "There are simply too many different tools that come up in the design phase, and there isn't one vendor who can provide everything we need. But we must have a way of integrating systems."

Howard believes that Northrop is already well on the way to such integration. But much is left to be done. Northrop, a vocal promoter of industry standards, belongs to various committees on Open Systems Interconnect, Manufacturing Automation Protocol/Technical and Office Protocol and other standards-seeking bodies. Howard has drummed up support for an Information Technology Committee within the Aerospace Industry Association, and because he took the lead, he was named the first chairman.

"We have to worry as an industry about how we produce products because our customer, the government, is aggressively setting standards at the same time as the computer industry. We find ourselves caught between a rock and a hard place," he says.

As a major defense contractor, Northrop often operates in varied and changing competitive situations. It may be competing fiercely against a company for one contract and working together with that same company as a co-contractor on another deal.

"We find ourselves with lots of strange little links," Howard says, "and from an information standpoint, it's going to get horrible. You not only need ways to interconnect, but you have to throw on top of that a need for security. On one project, that competing company can't know anything about the project; but on another, they are intimate partners."

As it struggles with the standards question, Northrop continues to invest heavily in computing. The company purchased a former automobile assembly plant in Pico Rivera, Calif., and turned it into a 3.3 million-sq-ft, state-of-the-art center for aircraft weapon systems design, research and manufacturing of the B2 bomber. The Aircraft Division's $43 million Integrated Simulation Systems Laboratory uses computer simulation to help engineers evaluate design options for building advanced aircraft.

With its difficult systems mandate, Northrop must attract and keep good people. Howard claims that this task is not a problem at all. Northrop was included in the book *The 100 Best Companies to Work for in America*. And because it is at the leading edge, the company manages to land top-quality professionals.

"Northrop is known as a good place to work," Howard says. "We have a built-in philosophy that we want the top people, not just bodies. We want the *right* people who will keep us in the lead."

Rifkin is a Computerworld *senior editor.*

> **Northrop realized it could significantly improve its quality and output by moving to 3-D workstations.**

Beyond automation: For manufacturing, it's a matter of timing

By Sheryl Kay

Powerful military jets, sleek four-door sedans and rugged farm tractors have one thing in common: None can be produced today without the effective use of information systems on the factory floor.

The significance of information systems to aerospace, automotive and industrial manufacturers requires major investments to automate production and streamline engineering. Companies in these businesses in the *Computerworld Premier 100* spend an average of 2.7% of revenue on information systems. Leaders like **McDonnell Douglas Corp.**, **The Lockheed Corp.** and **Deere & Co.** require budgets of 3.3% to 4% of their revenue.

"These industries compete on the basis of cost, quality and delivery," says Earle Steinberg, national director of manufacturing consulting at Touche Ross & Co. in Houston. "And you must be able to compete simultaneously on the basis of all three, which today can only be achieved through a strong commitment to information technology."

High visibility

Information services is a high-profile group in heavy manufacturing because it automates critical processes. "It all comes down to timing," Steinberg explains. "You have to know what parts flow where and when so you can cost production; in delivery, you have to be able to compress lead times and meet performance schedules; and in quality, you must identify any problems quickly and respond to them even quicker."

Though aerospace companies regard information systems as an absolute requirement, "There is a sensitivity to cost that is more a part of their culture than in other businesses," says Jim Schwendinger, a man-agement consulting partner at Touche Ross.

Many of the aerospace giants began developing premier systems back in the late 1960s, so they are concerned about extensive upgrade costs. "They can't just unplug all of these systems," Schwendinger points out. "They have to go back and replace each system carefully."

An important function of information systems in aerospace is to help reduce the time between initial engineering and production. Although some firms still run stand-alone systems, most are moving to computer-aided process planning.

"They don't necessarily need a new graphics package," Schwendinger says, "but they are just beginning to integrate all of the systems' capabilities."

Adds Steinberg, "These companies are generating numerical control instructions directly off their computer-aided design drawings."

Eliminating paper

Systems are also used to coordinate major projects between suppliers, contractors and the government. "We can get rid of some of the paperwork," says Jim Sutter, **Rockwell International Corp.'s** vice-president of information services, "by moving it into electronic form and sharing it between the contractor and the government."

Perhaps the most unique calling for MIS in the aerospace industry is in cost reporting, where the pressure to provide accurate information is several notches higher than in other industries. According to Steinberg, the procedures here are quite different, and MIS seeks answers to different questions than other industries ask.

"In automotive, you collect data that pertains to unit cost," he explains, "whereas in aerospace, you are asking questions that relate to collecting data to comply with government reporting requirements."

As Pentagon expenditure scandals are reported in the news

Ford's automated assembly line

media almost weekly, the cost-reporting burden is becoming extraordinary for MIS. Most contractual agreements with the government are imposing more detailed standards for cost reporting.

Meeting these stricter standards becomes especially difficult, Steinberg observes, when a manufacturer is mixing projects. "Each project is negotiated with costs that have different allocation rules, which require significant changes in the system," he says.

MIS continues to grow in importance in the automotive industry, particularly in the past decade. According to Mike Weiner, a vice-president at Index Group, Inc. in Cambridge, Mass., some automotive companies once viewed MIS as the blue-collar workers of management.

"They've gotten some religion now," observes Weiner, "and they finally realize in-

"Automotive companies are realizing IS is critical to success."

formation services is critical to the success of the company."

But Weiner says the industry does not fully recognize the value of MIS. "It takes more than money," he says. "The industry still has not realized that the top MIS executive is going to be an integral member of the corporate management team."

Currently, the industry is focusing on improved quality and cost effectiveness through the use of technology. According to Weiner, "They are very cognizant of the need to reduce the product development cycle."

Like aerospace companies, auto makers are gaining efficiencies from integrating islands of technology.

"The integration begins with our CAD systems in engineering and continues through to the bill of materials, parts procurement, manufacturing and corporate accounting systems." says Jerry Decker, man-

ager of corporate systems planning at **Ford Motor Co.** in Dearborn, Mich.

Ford placed ninth, well ahead of rivals General Motors Corp. (13th) and Chrysler Corp. (18th) in the industry ranking of the *Computerworld Premier 100.*

Graphics use growing

Graphics is one extremely important emerging technology area, especially from the standpoint of moving engineering drawings from one location to another.

Ford is now developing its graphics technology so that there will be a central repository for all drawings. This central system will allow any engineer to access another engineer's drawing for viewing and modification.

Other technologies being explored by automotive and tractor makers include artificial intelligence for diagnostics in the repair shop, vision systems for product design within the manufacturing plant and bar coding for materials management.

Kay is a Tampa, Fla.-based business consultant and free-lance writer.

AEROSPACE, AUTOMOTIVE AND INDUSTRIAL

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**Northrop Corp.** Los Angeles 47,500	3	14,800	$6,053M	$94.2M	$300M
2	**McDonnell Douglas Corp.** St. Louis 109,000	9	13,885	$13,146.1M	$313M	$550M
3	**The Lockheed Corp.** Calabasas, Calif. 98,100	14	13,195	$11,370M	$421M	$400M
4	**Textron, Inc.** Providence, R.I. 66,500	31	11,865	$5,661.4M	$256.3M	$150M
5	**Deere & Co.** Moline, Ill. 37,900	32	11,840M	$4,134.5M	-$99M	$140M
6	**Rockwell International Corp.** El Segundo, Calif. 118,700	34	11,825	$12,123.4M	$635.1M	$450M
7	**Caterpillar, Inc.** Peoria, Ill. 53,800	41	11,450	$8,180M	$350M	$140M
8	**United Technologies Corp.** Hartford, Conn. 191,800	44	11,365	$17,170.2M	$591.7M	$300M
9	**Ford Motor Co.** Dearborn, Mich. 350,320	86	10,325	$71,643.4M	$4625.2M	$836M
10	**General Dynamics Corp.** St. Louis 105,400	90	10,265	$9,344M	$437.3M	$200M

A MAN WITH A MANDATE: TRAVELERS' NEW CHIEF OF SYSTEMS, LARRY BACON

By Alan Radding

A mandate from the top makes information systems the No. 1 priority. The former head of the organization was a high-profile leader who seemed to do all the right things. What more could Larry Bacon, new systems chief at The Travelers Corp., ask for?

Plenty.

Despite a directive from the company's chairman to leverage technology in all Travelers' businesses, there remains resistance at all levels of the organization. In addition, for all that Bacon's predecessor, Joseph Brophy, achieved with information systems, the hardest challenges are still to come.

As Bacon says, "All the easy things have been done."

The Travelers' commitment to using information systems to create competitive products — signified by 9% of revenue spent on MIS — makes it the No. 1 insurance and financial services company and No. 4 overall in the *Computerworld Premier 100*.

Two years ago, Travelers Chairman Edward H. Budd issued a mandate to take advantage of technology in each of the company's businesses as the first of three top priorities. The other two were to make service preeminent within all aspects of the operation and to preserve the company's human resources through the careful cultivation of talent.

While the second two priorities are clearly applicable to information systems as well as every other part of the company, the chairman's first priority singles out information systems management and staff as the driving force of corporate strategy.

"Those are our marching orders," says Bacon, whose title is senior vice-president of data processing and telecommunications.

A 20-year veteran of The Travelers' DP operation, Bacon moved into the top technology slot in April, following the transfer of his

The Travelers' Larry Bacon

boss, Brophy, from MIS to one of the company's major line businesses, employee benefits.

Bacon inherited a difficult assignment. At Travelers, information systems have long been installed in all the obvious places where they could provide an immediately apparent benefit.

"We already provide the core things — low cost, reliable, responsive systems," Bacon says. "We've cut response time on the network down to 1.2 seconds, and the unit

cost is dropping yearly. We've reduced CPU charges 15% a year. We've got a complete set of [basic] applications, as good as any in the industry."

But that isn't enough. The new goal of information systems is to penetrate to the very heart of Travelers' business and operations.

"We're involved in a very complex set of issues: What is the effective use of technology? Where is Travelers going?" Bacon says.

Seen in this light, information systems is no longer just a service but an integral part of

the organization's business, strategy and goals. Bacon envisions new systems that will take information and put it to work in the organization in different ways. For example, he wants to make as much data as possible available to users who require it for their business functions.

Bacon sees Travelers' Client Access and Risk Management Analysis (CARMA) program as an example of future applications. For years, the company collected detailed information about employee claims submitted by large corporate customers. The CARMA program makes this data available to the client companies so that they can analyze the patterns of losses and take preventive measures.

In the past, Travelers brought computer power to diverse functions of the business. For the future, the goal is to "automate the total process of our changing business. That is an order of magnitude beyond where we were in the past," Bacon asserts.

For example, Bacon foresees expert systems that automate the issuing of policies from the initial customer application through the issuance of the final policy, including the underwriting. If an underwriter is required to step in, the system would automatically communicate with him, Bacon explains.

To implement this level of capability, Travelers looks to artificial intelligence as a key area. Several AI projects that utilize expert systems are already under way, and Bacon reports a growing awareness of expert systems across the company.

Of less interest is image processing. Travelers is trying to get away from paper as much as possible, and Bacon doesn't yet see how image processing helps achieve that goal. "Image processing is another way to store paper, not eliminate it," he says.

Overcoming reluctance to change

To deal with the reluctance to accept the importance of information systems within Travelers, Bacon encourages ongoing dialogue between his group and the other parts of the company. "We're talking about change, inside and outside DP," he says.

Input from the line managers is critical if the company's business groups are to leverage technology successfully. "You can't have DP people invent everything, no matter how well they know the business," he says.

The idea for the CARMA program came from "one of the least technical people," he notes. "He saw a problem, and we sat down and started talking."

Bacon's department is closely structured along Travelers' lines of business. In addition to the basic operations and administrative segments, there are groups aligned with each of the company's business divisions, such as employee benefits or the agency marketing group, which report to Bacon.

While the business systems groups still reside within centralized data processing, they try to function much like a decentralized department. Bacon reports to Tom Thorsen, the chief financial officer, who reports directly to the chairman.

A sign of the greater role of information systems at Travelers is Bacon's frequent reference to bottom-line results. "We've always been concerned with the bottom line, that our systems were contributing and making a difference, but it intensified in the past couple of years," he says.

Radding is a Boston-based author specializing in business and technology.

🏠 BEST OF THE REST

Risk-taking keeps financial services ahead of the game

By Suzanne Weixel

Insurance and financial service firms were among the first to adopt PCs.

Betting on the future is a risky business.

But in the insurance and financial services industries, such bets are the only way to gain competitive advantage through information systems.

"Even as a company adopts the newest technology, everyone else in the industry is adopting it as well," says Alex J. Pollock, a former industry consultant at Nolan, Norton & Co. "If a company doesn't try something different, it will be left in the dust."

The top insurance and financial services companies in the *Computerworld Premier 100* spend an average of 3.4% of their revenues on information systems to gain leadership positions.

Risk-taking is the common denominator among these companies, says H. Thaine Lyman, national director of large-scale systems consulting at Touche Ross & Co. in Chicago. Many were among the early birds willing to

commit to buying personal computers by the thousands, well before these machines were a desktop way of life.

As a result, the companies own an average of more than one PC or terminal per employee, the highest ratio in any of the 10 industries covered in the Premier 100.

"A number of these companies have spent money on something that, at the time, just sounded like a good idea," Lyman says. "They've broken away from the follower mentality and therefore have assumed leadership roles."

For example, such investments are applauded at fourth-ranked **Metropolitan Life Insurance Co.** in New York. "Top management encourages us to try new technology," says Daniel Cavanagh, senior vice-president of information systems. "Sometimes it leads to failure, sometimes to success. But if you don't try, you can't learn."

Corporate philosophy takes a different tack at fifth-ranked **Teachers Insurance & Annuity Association** (TIAA), also headquartered in New York. Teachers' John Putney, executive vice-president for operations support, dislikes being labeled a risk taker.

Part of the plan

According to Putney, his company makes use of new technologies only if they fit in with business priorities. "We would not jeopardize a business plan just to use a particular technology," he says.

But, Putney acknowledges, if TIAA sees an opportunity to make use of a technology to advance a business strategy, the company jumps on it.

For instance, TIAA operates a voice-activated phone system that allows policyholders to make inquiries and conduct transactions without human assistance.

While voice-activated computers may not be unique to his company, they illustrate the use of technology to introduce the firm's new products. Says Putney, "We can respond faster to customers. So we can offer more products without bogging down."

Competition in the industry is intense. To be profitable, a company not only needs to try something new, it also must figure out how to make it work.

At 10th-ranked **Farmers Insurance Group**, the tool that propels the company's success is an agency computer system that can be accessed by 70% of the Farmers' agents nationwide.

"The agents can service any policyholder, anywhere in the country," says Edward Terhar, vice-president of systems planning. "Other insurance companies provide agents with databases of their clients. We not only include all of the information on all of the policyholders everywhere, we update it daily."

Dual strategies

According to Pollock, now president of Community Federal Savings in St. Louis, most companies, particularly those in insurance and financial services, employ two basic modes of strategic operation:

● Offensive — using technology to do something no one else is doing.

● Defensive — using technology to keep up with the competition.

"There's nothing wrong with operating

on the defensive — as long as you know what you're doing," he says. "You can make average returns using new technology to lower your operating costs. But it's the offensive strategy that gives you the competitive edge."

Many firms use technology to carry out an internal commitment to quality service.

"Our company philosophy is based on service," Terhar says. "Everything we do is driven by the need to support the agents in providing service to the policyholders."

Metropolitan Life's Cavanagh acknowledges a similar philosophy. "Technology for technology's sake went out with the '70s. Now we use it to satisfy customer requirements," he says.

The systems organization must also be very well managed if it is going to help the company's bottom line, says Touche Ross' Lyman. A well-run organization can take on new challenges without disrupting the quality of service it provides.

"Quite often," Lyman says, "internal operational excellence can in and of itself be a strategic advantage."

Thomas Pettibone, vice-president of information services and systems at second-ranked **New York Life Insurance Co.**, agrees. He attributes some of the department's success to its organizational strategy. "We're centralized, but we have found a way to maintain a decentralized focus," he says. "We have placed top systems personnel in each business department to serve as business analysts. They are in a position to bring systems planning knowledge to the business centers on a day-to-day basis."

Pettibone also credits top management's support of long-term technological excellence. "They have made an overt financial commitment to using technology to make us competitive and to keep us competitive," he says.

For example, the company provides a

A well-run firm can take on challenges without disrupting the quality of service it provides.

support system that allows agents on-line access to client files.

Currently, Pettibone says, New York Life is nearing the end of a four-to five-year project intended to enhance the company's overall electronic responsiveness.

"Management took a look around and said, 'In order for us to compete in the '90s, we have to do this now,' " he explains.

TIAA's Putney admits that without putting some faith in advancing technology, the company could not achieve its goals.
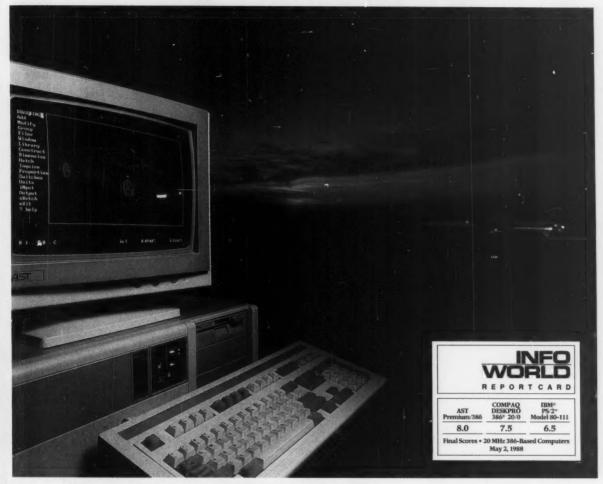
Referring to an electronic publishing system that lets TIAA customize option information for particular customer institutions, Putney explains, "We couldn't serve our customers so effectively any other way."

Weixel is a free-lance writer based in Framingham, Mass.

INSURANCE AND FINANCIAL SERVICES

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**The Travelers Corp.** Hartford, Conn. 33,900	4	14,600	$3,826.6M	$62.8M	$350M
2	**New York Life Insurance Co.** New York 19,746	23	12,410	$5,596M	$137.1M	$125M
3	**Nationwide Mutual Insurance Co.** Columbus, Ohio 12,000	30	11,935	$6,923.2M	$15.8M	$130M
4	**Metropolitan Life Insurance Co.** New York 38,000	43	11,380	$13,963.8M	$359.9M	$225M
5	**Teachers Ins & Annuity Assn.** New York 3,065	45	11,345	$3,059.7M	$206M	$56M
6	**American Express Co.** New York 81,500	51	11,080	$17,768M	$533.3M	$800M
7	**Primerica Corp.** Greenwich, Conn. 24,800	65	10,820	$3,762M	$198.6M	$120M
8	**Mutual Benefit Life Insurance Co.** Newark, N.J. 4,594	68	10,700	$2,020.7M	$35.4M	$45.4M
9	**St. Paul Companies, Inc.** St. Paul, Minn. 9,832	80	10,410	$3,366M	$324.3M	$105M
10	**Farmers Group, Inc.** Los Angeles 3,900	82	10,405	$6,328.8M	$246.7M	$75M

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INFORMATION TECH PROVES A TONIC FOR ABBOTT LABORATORIES

By Amy Bernstein

The information systems that provide competitive advantage for Abbott Laboratories are so closely guarded that the company recently refused national attention in *The Wall Street Journal.*

Sufficient details of the company's use of technology are known, however, to rank it as the top pharmaceutical company and No. 1 among food and consumer products producers in the *Computerworld Premier 100.*

Kenneth Farmer, vice-president of MIS, leads Abbott's systems organization in its efforts to gain ground in the research-intensive pharmaceutical industry. He commands a $100 million to $150 million information systems budget — approximately 3% of the company's $4.3 billion 1987 revenue — and oversees 21 minicomputer and mainframe sites. Another $100 million to $150 million makes up the installed value of major processors.

Besides hefty spending, keeping MIS staff expenses down to 34% of the budget and providing 6% of the information systems investment for training helps position Abbott as the seventh most effective user of computer systems overall. In addition, 38% of the company's employees have access to personal computers and terminals — another indication of the importance placed on technology.

For Abbott and its peers, which are besieged by competitive and economic pressures, information technology is proving to be the best medicine for continued corporate health. From sales and marketing to clinical trial management, pharmaceutical companies increasingly rely on computers to obtain and analyze vital statistics as quickly and accurately as possible.

"We're witnessing the beginnings of a data explosion in the industry," observes Arthur Anderson's George Smith, an industry consultant.

In three broad areas — some emerging, some mature — technology is helping contain costs and improve productivity, if not actually promote competitive advantage:

● Compressing product development — that is, decreasing the time required to bring a new drug to market.

● Managing information, from clinical trial data to Food and Drug Administration approval processes.

● Delivering and distributing drugs, medical equipment and diagnostic services to markets electronically.

On the research and development front, Abbott, in North Chicago, Ill., was among the first to pursue the area of computer-assisted molecular design — part of an industrywide move toward computer-aided drug design. Traditionally, Abbott researchers could only screen compounds to see how well they worked. Now they can simulate on computers how compounds work, providing more specific molecules with fewer side effects. The approach is not only more accurate but more cost-effective as well.

Used CAD for AIDS test

In another computer-aided drug design effort, Abbott linked chemicals and computerized instruments together to hasten development of the first test to detect AIDS virus antigens; the test is now awaiting FDA approval.

Many drug companies are also adding computer "smarts" to their basic arsenal of scientific instruments. For example, a typical clinical blood analyzer is now also a computer that performs data reduction and interpretation and pipes results directly into a hospital's information system.

THE IMAGE BANK

Pharmaceutical firms use systems to speed development.

Along these lines, Abbott's pharmaco-kinetics computer program helps clinicians interpret and recommend appropriate patient dosing levels. The firm offers use of the program on a fee-for-service basis to customers using its Therapeutic Drug Analyzer system.

So great is the demand for the convenience of on-line order entry that Abbott and other companies provide multi-vendor purchasing networks. Abbott operates Quiklink, with more than 30 vendors on-line. Competitive advantage here is virtually moot; medical supply networks are rapidly becoming an expected service.

Abbott also operates a computerized drug delivery system that enables hospital pharmacies and other customers to add injectable drugs to their patient intravenous fluids. Abbott's ADD-Vantage drug delivery system is an industry leader and an important element of the company's highly profitable diagnostics division. The system offers 33 different drugs, including five of its own.

The chief advantage of the system for the supplier is fast access to large markets. For instance, in 1987 Abbott introduced an antibiotic, clindamycin, to the ADD-Vantage network. The exposure subsequently helped the company earn a sizable share of the U.S. market for clindamycin. Within five years, Abbott expects ADD-Vantage to be used in virtually every hospital in the U.S.

The industry is also experimenting with optical disk-based text-and-image storage. These systems are being used, for one, as decision support systems that help managers and researchers sort through enormous amounts of information on FDA requirements, commercial rationales for new products, business case development and other aspects of drug marketing.

Pharmaceutical firms experiment with optical disks for decision support.

Optical systems may also eventually be used to send filings to the FDA for new drug applications. The approach may one day replace the 40,000-page paper documents now required, but Smith says it is still very much in the early experimentation phase.

Abbott faces stiff competition from long-established firms, like Smith Kline Beckman Corp., and revived entrants, such as Eastman Kodak Co.'s Sterling Drug, Inc. A key strategy to meet new demands is diversification. Abbott is making aggressive — and lucrative — inroads into the medical testing, or diagnostics, and nutritional formulas markets.

Diversification has implications for cost and efficiency: As the company's drug portfolio expands, so too does its need to access and manage large amounts of data in R&D as well as production, distribution and marketing. Such pressure will continue to increase the importance of information systems to Abbott and others in health care.

Bernstein is managing director of Gavroche Associates, a communications consulting firm in Cambridge, Mass.

FOOD, PHARMACEUTICAL AND CONSUMER PRODUCTS

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**Abbott Laboratories** North Chicago 36,800	7	13,925	$4,387.9M	$632.6M	$125M
2	**Baxter Healthcare Corp.** Deerfield, Ill. 62,500	11	13,725	$6,223M	$331M	$160M
3	**Merck & Co.** Rahway, N.J. 31,100	21	12,535	$5,061M	$906M	$150M
4	**Pfizer, Inc.** New York 40,700	36	11,700	$4,920M	$690M	$125M
5	**Smith Kline Beckman Corp.** Philadelphia 35,000	39	11,605	$4,328.8M	$570.1M	$175M
6	**Sara Lee Corp.** Chicago 89,700	50	11,095	$9,154.6M	$267.1M	$250M
7	**Johnson & Johnson** New Brunswick, N.J. 777,000	71	10,650	$8,012M	$833M	$200M
8	**RJR Nabisco, Inc.** Atlanta 120,334	75	10,485	$15,868M	$1,209M	$240M
9	**Pepsico, Inc.** Purchase, N.Y. 219,500	79	10,410	$11,500.2M	$594.8M	$250M
10	**The Coca-Cola Co.** Atlanta 22,700	84	10,375	$7,658.3M	$916.1M	$100M

Richard H. Shriver, McGraw-Hill's senior vice-president of technology

MCGRAW-HILL TAPS ONE UNIFIED SYSTEM FOR MANY MARKETS

By Connie Winkler

One hundred years after founder James H. McGraw bought his first magazine, McGraw-Hill, Inc. is leveraging its investments in information systems to capture even more business in publishing and communications markets.

But the company recently decided that diversity, while good for business, is bad for systems strategy. Richard H. Shriver, head of McGraw-Hill information systems, was named senior vice-president of technology July 1 to take command of a more centralized organization.

"It was extremely hard to provide a corporate view of technology or corporate oversight and coordination in the previous organization," Shriver says. "There were too many companies, too much autonomy; today there's commitment to work on a centralized basis."

With a systems budget that is about 7% of annual revenue, McGraw-Hill makes one of the largest investments in information systems for a company its size, causing it to rank above other service companies in the *Computerworld Premier 100*.

The systems reorganization is part of a corporate restructuring that combined a half-dozen market-focused companies into three main ones.

"All three companies have great opportunities and challenges in the marketplace, all totally different. My personal objective," says Shriver, from McGraw-Hill's midtown-Manhattan headquarters, "is to leverage the company's technology skills across organizational boundaries."

One of the most powerful ways McGraw-Hill's information systems capabilities will be used is to provide a pipeline through which all the company's real-time and on-line products can flow directly to internal corporate networks. "We are closer to accomplishing that today than we have ever been before," Shriver says. "The consolidation will allow us to focus on the remaining problems."

By providing integrated systems between divisions, the systems group will be able to meet customers' requirements for one access point for the company's services.

"Large companies with internal networks want a way to tap into our services and take only what they want without spending too much," Shriver says. "Now they have to spend time going through what they don't want, and they pay a fair amount of money to

France...The Channel waters are black with shipping, as reinforcements and supplies are funnelled ashore for the conquest of the Cherbourg Peninsula. (Credit: Bettmann)

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do it, not just for our services but others as well."

McGraw-Hill is not the only information services company that sees this market opportunity, but it hopes to get there first. "We're working on that opportunity in ways I can't talk about," Shriver says. "But they will be reflected in the projects we will be producing in the future."

The reorganization will also allow Shriver to assess the technology resources of the company, providing insight into better ways to leverage the skills at hand.

Some autonomy remains, however. Product development groups still make their own decisions, but capital investments over a certain amount require Shriver's sign-off. Shriver also started and will chair regular technology review meetings with the technology chiefs of the three companies.

The companies are: McGraw-Hill Publishing Co. (book publishing, *Business Week* and TV stations); McGraw-Hill Financial Services Co. (Standard & Poor's Corp. and Data Resources); and McGraw-Hill Information Services (which includes construction, computer and communications, legal, aerospace and defense, health care and energy and process industries groups).

Last year, the company's revenue totaled $1.75 billion, yielding a net income of $164 million; however, McGraw-Hill in the last year was plagued by jumpy stock prices, takeover rumors, acquisitions and sell-offs, and corporate shuffles.

A tribute to Ticker III

Among the company's systems accomplishments to date, Shriver rates Standard & Poor's Ticker III, the real-time financial data service, as the most successful. This tribute is particularly due to the Ticker's performance on Oct. 19, 1987, when 604 million shares were traded.

"We think we were the only pricing service that made it through without serious mishap," Shriver says. "We're in the business of supplying stocks and options to traders; a second can mean the difference between profit and loss."
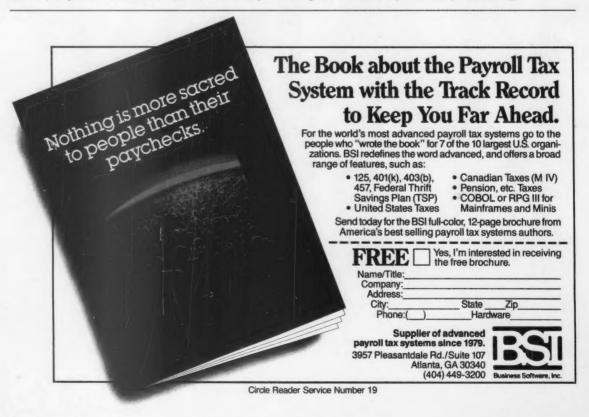
Standard & Poor's and McGraw-Hill use networks to keep Ticker and Marketscope, the real-time financial information service for brokers, up and running. There is redundant communication to the data center, much of it based on microwave.

Apart from integrating systems, McGraw-Hill is also trying to deliver data no matter what equipment the customer uses. "The customer doesn't want 11 terminals on his desk to get prices," Shriver says.

Standard & Poor's financial products are not the only ones being put through the technology Cuisinart by McGraw-Hill product developers. A bond information service, bits and pieces of which were variously available — such as the Standard & Poor's Blue List, traditionally printed on blue paper — is now available electronically.

McGraw-Hill also provides products on popular compact disk/read-only memory (CD-ROM) disks, including the long-standing *McGraw-Hill Encyclopedia of Science & Technology*. Standard & Poor's Compustat database of corporate financial information is available on CD-ROM for personal computers so data can be readily transferred to PC applications, such as spreadsheets.

Winkler, former New York bureau chief for Computerworld, writes about information strategies and management technology.

◎ BEST OF THE REST

In transport, getting it from here to there is no longer enough

By Michael Ball

The gentlest way to describe information systems managers in the transportation and other services industries may be "alert." Carriers of people, parcels and information are running hard to keep up with one another and with demands from customers.

Leading the pack among major airlines is **AMR Corp.**, the parent of American Airlines, in Fort Worth, Texas. AMR ranked second among transportation and other services companies in the *Computerworld Premier 100*, several steps ahead of direct competitors Texas Air (No. 12 in the industry and 158th overall) and United Airlines (No. 14 in the industry and 166th overall).

Factors contributing to American's leadership position are information systems spending, totaling 5.5% of revenue compared with industry average spending of just greater than 4%, and a better than 1-to-1 ratio of personal computers and terminals to its more than 60,000 employees.

While airlines are often measured by how long passengers wait before their plane takes off, their information systems are embroiled in pitched battles over reservations systems. Points are scored in the competition based on precision-data juggling for reservations, baggage routing and tracking.

Similarly, in the package delivery end, simply getting the goods from point Y to point Z on time is not enough anymore. The services are in a frenzy of competition to provide fuller, faster, more frugal service.

"Competitors were offering technology to customers, and we suddenly found that we had to, too," says Frank Erbrick, **United Parcel Service's** vice-president of information systems. "You can only ask people to work so fast, and the rest of it has to come from technology."

On both sides of the industry, the short timing and high transaction rates put dual pressures on information systems. None of the goals is possible without computer-based technology fixes. One set of systems is aimed at effectiveness — measures and methods that make possible key services such as gate control and package tracking. Another set is for efficiencies. Systems staff is charged with locating waste and redundancy, pointing the way to lower cost operations.

The systems side of transportation companies must hit the ground running every day — particularly for airlines, which are still adjusting to deregulation and consolidation.

The pressure mounts

The stresses will only build, says George Rusznak, an industry analyst at the Index Group in Los Angeles. "There is a lot of pressure to be efficient and to deliver high-quality service."

For the airlines' information systems groups, this pressure means the following:
- Developing and continuously fine-tuning reservations systems with upwards of 50 million flights and fares.
- Maximizing each flight's yield of revenue per passenger.
- Managing passengers, fuel, luggage, freight and gate traffic.

The winners will be the ones that use systems to balance cost and quality concerns best during the next few years, Rusznak says.

One of the ironies is that growth almost always means loss of ability to manage quality. For example, Rusznak cites Scandinavian Airlines, which is wrestling with the issues. Two years ago, the new chief executive officer of the firm decided it needed to compete on service to reverse an $80 million loss. He eliminated some middle managers and gave service providers such as flight attendants authority to manage passenger requests.

The result was a $30 million profit within one year but a loss of control over costs. The firm is now trying to balance service and size without losing profit.

"The only way to fix this is with technology," Rusznak says. "You need to redesign the control system without the traditional hierarchical structure of organization. You need to maintain control without a large number of supervisors and middle managers."

On the way to solving such seminal problems, the systems people still have to help run the airlines. In AMR's case, this responsibility means dealing with the myriad mundane concerns of American and the separate

Federal Express' packaging center

issues of its Sabre reservation system.

Sabre is a separate $405 million division, the largest of five reservations services used by travel agents throughout the country. Yet it is also a marketing tool, reinforcing American Airlines' presence and the perception of customer service.

The systems issues for Sabre are plain, according to AMR's John Hotard, senior representative of corporate communications. "We have 43 million fares in it, with up to 1.5 million changes a day. There is no way to track these without computers," Hotard comments.

Catching up

Even more obvious effects of systems' importance in the industry became unmistakeably apparent to UPS' managers in Paramus, N.J. "In 1985, we became aware there were other carriers," Erbrick quips. "We were unequivocably too slow in responding to

> ## "You can only ask people to work so fast; the rest of it has to come from technology."

what the public saw as value-added services," he adds. "That year, there was a board-level decision to reorganize."

In the package delivery end of the business, the decision meant proving that UPS could match **Federal Express Corp.**, as well as other carriers, in providing systems services. Competitors were providing customers with data in forms and varieties their individual computer systems could use, including sophisticated billing and tracking.

Then, UPS upped the ante with plans to spend $1.3 billion dollars on systems by 1992.

Despite its new commitment to systems, UPS ranks eighth among transportation and other services companies in the Premier 100, with systems spending at about 4% of revenue.

Federal Express shows up three places higher, partly on the basis of investing 5.4% of revenue in information systems. Even

more drastic is the difference in overall rank — Federal is 61st on the list, compared with UPS' 106th position.

UPS' "catch-up-and-surpass" program includes 22 initiatives, each one a major systems project. One project is an international package brokerage scheme designed to make such traffic as "simple and transparent as shipping from Pennsylvania to New Jersey," Erbrick says.

In pilot stage now, the project places all content, destination and other package data on the outside of the box or envelope. Customs gets the data in advance and specifies which items it will check. These are routed for inspection automatically, with the intent of taking hours or even days off arrival time. The program was two years in the making and will be introduced internationally in October.

Erbrick gleefully states that such programs "will give us a great competitive advantage." However, he admits that "the lead times on such systems are so difficult; some require you to bet your company on the decision."

Ball is a free-lance writer based in Boston.

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TRANSPORTATION AND OTHER SERVICES

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**McGraw-Hill, Inc.** New York 15,600	12	13,295	$1,751.2M	$164.8M	$125M
2	**AMR (American Airlines)** Dallas 59,700	18	12,720	$7,198M	$198.4M	$400M
3	**CBS, Inc.** New York 6,900	58	10,915	$2,762M	$452.8M	$40M
4	**Time, Inc.** New York 5,400	60	10,885	$4,193.5M	$249.8M	$60M
5	**Federal Express Corp.** Memphis 46,300	61	10,840	$3,522M	-$65.6M	$190M
6	**Dun & Bradstreet Corp.** New York 59,000	63	10,830	$3,359M	$393M	$50M
7	**Capital Cities/ABC** New York 20,000	88	10,270	$4,440M	$279.1M	$60M
8	**United Parcel Service of America** Greenwich, Conn. 191,600	106	9,655	$9,682.2M	$784.2M	$400M

DOW MOVES SYSTEMS TO GREATER CORPORATE ROLE

By Michael Sullivan-Trainor

Already advanced in applying computer systems to produce breakthroughs — such as biodegradable plastics — Dow Chemical Co. is awakening to the use of technology for strategic advantage.

The $13.4 billion company is giving information systems a higher profile on the way to providing the organization with a greater role in business planning. Once falling under the jurisdiction of vice-president of engineering and manufacturing, information systems now reports to the president of the U.S. division.

"Seven months ago, we moved out from under the line function," says Hans Huppertz, director of information systems and communications services. "The executive committee recognized the need to see how we can make better use of information systems."

Currently, the information systems department is charged with a major task — redesigning order-entry systems to speed response times to customer purchase requests. The project is key to establishing the organization's credibility outside of development and production.

Dow, based in Midland, Mich., ranks No. 1 among chemical companies in the *Computerworld Premier 100* and No. 13 overall. The company spends an estimated 1.8% of revenue on information systems, which is below the industry average of 2%. In fact, No. 3 in the industry, E.I. Dupont De Nemours and Co. spends an estimated 2.5% of revenue on systems.

However, two factors contribute to Dow's higher ranking: profit increases of $683 million in 1986 and $499 million in 1987 — bringing total profits up from a low of $58 million in 1985 to a high of $1.2 billion last year — and owning nearly one terminal or personal computer for every two of its 52,000 employees, a setup that provides broad access to technology.

The large percentage of PCs within Dow is attributable to a commitment to sophisticated computer-aided engineering (CAE) workstations in research and development and manufacturing and plant design.

Moving to supercomputing

In R&D, chemical modeling and molecular design are accomplished using systems linked to an IBM 3090 processor with vector capability. Eventually, this system may be replaced by a Cray or a similar supercomputer, Huppertz says.

In plant design, three-dimensional CAE systems are used to reduce drafting costs and increase the speed of the process. Since chemical product developments are closely tied to production requirements, plant design involves the integration of processing, product and construction groups.

The engineering and design workstations are a combination of Intergraph, Autocad and PC-based products, many of them driven by DEC VAX and Microvax computers.
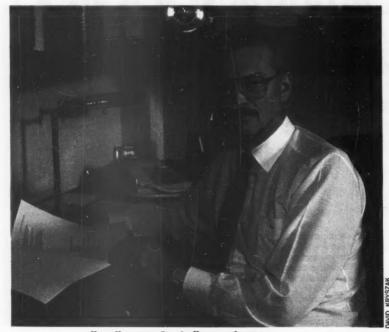
While the CAE projects are in place, the order-entry system is now being developed. "The system is part of our emphasis on providing quality service," Huppertz says.

Currently, when customers call in to place orders, they must wait to receive a call back from a sales representative to notify them if the company has sufficient inventory to fulfill their order and let them know when it will be shipped.

When completed, the new system will process all calls at a central order service center. Sales representatives will use a central database to view a profile of the customer and check product inventories.

The sales representatives will be able to say immediately if and when an order can be fulfilled as well as determine what mode of

Hans Huppertz, Dow's director of systems

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delivery would best meet the customer's needs.

"It will allow us to provide a quicker response and make adjustments to the volume of our inventory based on the orders we receive," Huppertz says.

When the application is in place early next year, the order-entry centers will be consolidated from six to one. Huppertz is using a combination of his staff and outside contractors to develop the system. He is also buying modules of the application from outside vendors. "We're trying to bring the system to the market quickly," he says.

Another area of development at Dow is a worldwide voice and data network, which provides a backbone for the company's electronic mail system. The network requires linking a diverse array of Digital Equipment Corp. and IBM equipment.

"We've always been a two-vendor company," Huppertz adds. "We will never be all DEC or all IBM."

The DEC systems are more popular with engineering, research and manufacturing departments, while IBM mainframes are operated for large number-crunching applications. "Over time, we hope to come up with a common systems approach with common applications that use both kinds of systems," Huppertz says.

Dow runs 14 to 15 large data centers. "We'll have an IBM mainframe in each center and a cluster of DEC equipment in a room next door," Huppertz says.

Electronic data interchange (EDI) is also an important systems area at Dow, which does business with Ford, a major EDI advocate. Sixty key suppliers are using EDI to work with Dow, which uses third-party EDI services.

Currently, there is a drive to sign up customers on-line along with suppliers. Six are currently using EDI at their sites.

Expert systems is one technology that Dow refuses to implement on a large scale. There are some two dozen expert systems in applications such as process control and diagnosis, but the jury is still out on how useful they really are. "We're not like a Du Pont that has gone way out ahead in expert systems. We're still trying to understand what they can do," Huppertz says.

On the other side, Du Pont is less interested in engineering workstations than Dow. Huppertz suggests that technology champions in development at the two companies each choose their favorite types of systems.

Improving productivity is an important strategy at Dow, which presents income-per-employee figures in its annual report. For 1987, an all-time high of $43,100 of income per employee was reported.

"Information systems is, in part, responsible for productivity increases," Huppertz

> "We've always used two vendors. We will never be all DEC or all IBM."

points out.

Traditionally, productivity improvements were achieved through automation. In fact, five years ago, Dow's systems organization was much more involved with reducing costs. Today, Huppertz's organization is also measured by its ability to improve the company's market share.

"Information systems came up through the clerical side of the company. But today, we are focused on what is strategic to the company," he says.

The strategic emphasis is composed of goals such as improving quality, increasing productivity, lowering costs, enhancing management's efforts and differentiating customer services from those of leading competitors.

The order-entry system, CAE workstations that facilitate the integration of multiple departments and the worldwide network are the systems tools Dow is using to achieve its goals.

Out of such support comes new developments like the chemicals to allow the creation of biodegradable plastics.

"We have a lot of computing capability in the research and development areas," Huppertz says.

Sullivan-Trainor is Computerworld's *special projects editor.*

CHEMICALS

Industry rank	Company/Location/Total Employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	Dow Chemical Co. Midland, Mich. 52,200	13	13,215	$13,377M	$1,240M	$250M
2	American Cyanamid Co. Wayne, N.J. 34,267	37	11,695	$4,166M	$276M	$75M
3	E.I. Du Pont De Nemours and Co. Wilmington, Del. 140,700	52	11,030	$30,468M	$1,786M	$775M
4	Monsanto Co. St. Louis 50,700	59	10,890	$7,639M	$436M	$160M
5	Union Carbide Corp. Danbury, Conn. 43,119	69	10,675	$6,914M	$232M	$125M
6	W. R. Grace & Co. New York 40,000	140	8,740	$5,046.3M	$173.1M	$90M
7	Ethyl Corp. Richmond, Va. 10,300	165	8,005	$1,720.3M	$193.3M	$19.8M

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BANC ONE INVITES YOU TO THE BANK OF THE FUTURE

By Michael Sullivan-Trainor

Behind every successful bank marketing scheme is the computer that makes it work. At Banc One Corp. this generalization is gospel.

To differentiate itself from competitors, the Columbus, Ohio-based bank is experimenting with a "branch of the future." Located on Saw Mill Road in Columbus, the local office features bright-blue neon signs with curlicue letters proclaiming banking services. The resemblance to a food store or clothing outlet is purely intentional.

"Nobody likes to go to the bank," says David M. Van Lear, president of Banc One Services Corp., the bank's information systems subsidiary. "They want to go shopping or to the movies but not the bank. We're trying to change that."

Big risk

Challenging the traditional view of banking with a jazzy presentation is a marketing risk. But the information systems needed to turn the branch of the future into the bank of the future represent a greater technology risk.

"If you're really going to try new ideas, you have to take them to the stage where you develop them and offer the new products to the market," says Van Lear, echoing a corporate philosophy expounded by Banc One Chief Executive Officer John B. McCoy.

Banc One's corporate culture encourages experimentation and is proving to be fruitful ground for information systems: The bank ranks No. 1 in its industry — above larger peers like Citicorp and Chase Manhattan Bank — in the *Computerworld Premier 100*. Strong profits, solid MIS training and personnel expenditures and an information systems budget that exceeds 7% of income are the reasons why Banc One outdistances its rivals.

The Saw Mill Road experiment is a good example of where business-directed technology investments can lead. Standing atop a former cornfield, the year-old branch pro-

David Van Lear, president of Banc One Services

vides intelligent terminals at every account manager's desk and teller location. Charts, marked with brilliant yellow arrows, show customers the "best buys" of the day in the form of investment opportunities.

To choose the best buys for its customers, Banc One employees rely on applications that assess current market conditions and possible future scenarios.

The intelligent terminals are the technology platforms for a new generation of distributed banking applications currently being developed by Banc One. Cross-Sell Manager is one such application already being rolled out to the branches. The system automatically identifies which Banc One services meet the needs of the customer based on a profile supplied by the account manager.

"We can analyze the data at the personal computer level, and the application will recommend the products," Van Lear says, "It reduces training time and the amount of individual knowledge required for our employees."

Cross-Sell Manager is the first phase of a much more ambitious undertaking that will transform the way Banc One operates. In the fourth quarter of this year, the systems group will introduce the core products of the applications overhaul. The project, called Future System 90, is a joint venture by Banc One, Norwest Corp., which ranked second among banks in the Premier 100, and Electronic Data Systems (EDS), a General

Motors subsidiary.

Norwest and Banc One provide their financial industry expertise and the test beds to market the applications, and EDS contributes the technical expertise, large project leadership and coding capabilities. "I'm not sure any one banking organization can separately handle all the needs of the financial services industry," Van Lear says.

Future System 90 is more than just a reworking of Banc One's host applications. The strategy calls for the design and implementation of applications that push data and functionality to the lowest level in the organization. "There has got to be a different set of applications to deliver financial information services. We are not meeting the needs of the corporation today," Van Lear says.

The core product of Future System 90, Customer, will contain all the data about any bank customer based on all the products the customer has purchased. Access to all customer data in one place and the full functionality to manipulate it at the PC level will allow employees to better meet customer needs and market products. The change will also take a great deal of the processing burden off of the information systems organization and give it to the users.

"It will enable an account manager to see that someone's car loan is nearly paid and offer that person information about our attractive loan rates when the customer is thinking about a new purchase," Van Lear says.

The only constant

While turning the architecture upside down, Banc One's information systems staff is also supporting a company that is doubling in size every two years. Banc One finished 1986 with assets of $10 billion. Today, assets total $24 billion.

One key to coping with growth is anticipation. Expecting a Milwaukee bank to be acquired by Banc One last year, the information systems staff prepared to extend the T1 network in advance. The acquisition became official on April 1 and the network was in place by April 15.

Another factor that keeps growth under control is the Uniform Product Committee made up of representatives of all Banc One's departments. The committee defines the features and functions for all Banc One products and sets standards to guide their implementation. This leadership gives newly acquired companies a blueprint to follow in adapting to Banc One's operations.

Though Banc One is moving to a distributed architecture, Van Lear plans to keep his IBM mainframes. Their role will change from batch processing to file servers and network managers. Currently, the bank runs four 3090 series systems, a 3084 and a number of 4341 and 4381 processors in regional locations.

Mid-range processors, such as IBM's AS/400, are also part of Van Lear's plan to provide intermediate processing or backup functions to the mainframe work load. Soon there will be no room for dumb terminals, however. The distributed architecture requires intelligent microprocessors such as IBM's Personal System/2.

How successful will Banc One's latest experiment be? So far, no other bank in this country has implemented what Banc One, Norwest and EDS are planning to deliver by the end of next year.

Sullivan-Trainor is Computerworld's *special projects editor.*

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§ BEST OF THE REST

Banks must match business goals with systems strategy

By Suzanne Weixel

Remember life before automated teller machines? No cash on weekdays after 4 p.m. No cash at all on weekends. Running all over town to find a branch office. Actually carrying traveler's checks.

ATMs simplified life for nearly everyone. Except possibly the people responsible for keeping those ATMs technologically up to speed.

Even as banking information systems professionals today try to come up with new technological advances, they are realizing that technology is changing the very basics of the way their banks do business, says Charles Christy at Arthur D. Little, Inc. in Cambridge, Mass. One customer no longer equals one account. Now in processing a transaction, Christy says, a bank must consider the total scope of a customer's financial situation.

"A transaction no longer goes directly to a particular account; it goes to a relationship," he says.

The relationship may include checking and cash management accounts as well as home equity and car loans. How the bank does business with the customer depends on the relationship among these accounts.

Convincing upper management that information systems is the best way to manage these accounts is the first step in making use of systems for competitive advantage.

As Thomas Steiner, a partner at McKinsey & Co. in New York, explains, "Information services is a critical function that supports strategy in the banking business. But excellence in information services won't lead to excellence in business performance unless the fundamental business strategy is right."

Information systems spending is a key criterion to measure management's commitment. The top 10 banks in the *Computerworld Premier 100* invest a whopping average 4.9% of income in information systems budgets — the largest percentage investment of all the industries. Another average 2.2% of income represents the installed value of major processors.

As important as the amount spent is the way it is invested. Banks listed in the top 10 purchased an average of one personal computer or terminal for every two employees. They also spend nearly 35% of the average information systems budget on staff and another 3.5% on training.

An example of the match between business goals and systems direction can be found at **Home Federal Savings & Loan** in San Diego, ranked seventh among the top 10.

For instance, one of Home Federal's business goals is to process mortgage loan applications as quickly as possible. To meet this goal, the systems department implemented a microcomputer-based network for its field loan representatives. The representatives can sit down with a customer at his home or office and fit a program to his needs, finding the exact type of loan that best suits that customer. The application also lists exactly what paperwork must be done for the type of loan chosen.

"This system lowers the cost of application and speeds up the process," Chief Information Officer Edwin Nichols says.

Home Federal also uses microcomputers to provide its branches with access to a central information file (CIF).

"Our primary commitment in information services is to provide employees with access to the information they need to best administer banking services to customers. Tactically, it is very important to maintain a high level of systems availability even as we explore new technologies," he adds.

The branches require unlimited access to the CIF, and, according to Nichols, the system is available 99.6% of the time.

PCs for branches

At Home Federal, systems support also includes microcomputer-based sales tools for branch managers. The PCs provide access to daily reports as well as training programs that are downloaded to every branch. Home Federal will also soon offer its branches

Banks must do more than implement ATMs

knowledge-based systems that have the capability of reducing application processing times for mortgage loans and provide sales representatives with "what-if" analysis tools.

Nichols points out that "throughout the past seven to eight years, we have received full financial commitment to continue existing projects and to begin new ones. When we need to grow, we receive the resources we need."

The same cannot be said, however, for other areas of the bank that are facing budget limitations. "Executive management continues to invest in information technology even through tough times," Nichols says.

Signifying management's commitment, Home Federal spends 4.1% of its revenue on information systems.

An expanding view of systems at **Corestates Financial Corp.** in Philadelphia — ranked fourth among its peers — is leading to the development of new profit centers. About 40% of the company's total earnings originate from transaction product services,

according to Robert Gilmore, executive vice-president of Corestates Technology Group.

Corestates spends an estimated $60 million annually on information systems to run one of the largest shared ATM networks in the country and the largest bank-provided point-of-sale services network.

The systems group views itself as a product and customer service organization, focusing on developing products for consumer, corporate, international and domestic banking markets.

"We owe our success to identifying opportunities for products," Gilmore says.

Boosting productivity

As at No. 2-ranked **Norwest Corp.**, which is located in Minneapolis, the focus is on improving productivity as well as increasing sales. Norwest's information services department provides mid-range and microcomputer-based technology to the branches. Employees access the host computer for information on individual customers and customer relationships.

During the past five years, Norwest has undergone restructuring in all departments, due in part to a move toward more centralized control of smaller banks it acquired. "Everything we do is designed to meet Norwest's business requirements. We work extremely close with the banking heads," says John Geiken, manager of information services.

Geiken reports directly to the corporate executive vice-president of technology, who in turn reports directly to the organization's chief operating officer. Although there is no chief information officer per se at Norwest, the vice-president of technology performs that function.

Support for information systems within, according to Geiken, is evolving in large part because of an enlightened management. "But it is a two-way street. Just as management has spent some time learning about technology, the information services people have taken the time to learn about the business," he says.

Weixel is a free-lance writer based in Framingham, Mass.

BANKING

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	Bank One Corp. Columbus, Ohio 13,300	24	12,400	$1,960M	$208.9M	$150M
2	Norwest Corp. Minneapolis 15,900	29	11,975	$2,298M	-$29.8M	$110M
3	Bankamerica Corp. San Francisco 64,000	46	11,275	$9,753M	-$955M	$500M
4	Corestates Financial Corp. Philadelphia 7,700	49	11,160	$1,449M	$162.3M	$60M
5	Citicorp New York 89,300	54	11,020	$27,519M	-$1,138M	$1,500M
6	First Union Corp. Charlotte, N.C. 19,800	57	10,975	$2,626M	$283.1M	$120M
7	Home Federal Savings & Loan San Diego 43,000	70	10,650	$1,258M	$100.3M	$52M
8	First Chicago Corp. Mt. Prospect, Ill. 13,700	72	10,600	$4,245M	-$570.7M	$200M
9	Manufacturers Hanover Corp. New York 29,700	85	10,350	$7,757M	-$1,140.2M	$380M
10	First Wachovia Corp. Winston-Salem, N.C. 13,100	97	9,925	$1,796M	$176.6M	$50M

AMOCO'S SHREWD STRATEGY KEEPS IT AHEAD IN TOUGH TIMES

By Amy L. Bernstein

Until prices peaked and oil demand began to decline in 1981, industry leaders gave little thought to draconian measures of economy. But today, wide fluctuations in crude oil prices, lower U.S. petroleum consumption and deregulation are forcing oil producers to trim the fat.

This once invulnerable industry now pours money and energy into protecting against uncertainty and further down-cycles. Finding innovative ways of more efficiently managing assets growth is as important as straight cost-cutting.

Nowhere is organizational change more apparent than at Amoco Corp., the nation's seventh largest producer of crude oil, with 1987 revenue of $22 billion. According to Richard M. Morrow, chairman and chief executive officer, the "vagaries of the supply-demand equation" are prompting a major restructuring effort designed to position the company for an era in which there is "little prospect for price-induced growth."

Information technology plays a key role at Amoco in enabling it to improve profitability in the wake of consolidation. In fact, Morrow singles out technological expertise, along with cost control measures and global expansion, as the key strategies that will guide future performance.

Amoco's ranking as the No. 1 petroleum producer in the *Computerworld Premier 100* testifies to the company's application of computer technology. While its information systems spending of about 1% of revenue is no higher than its peers', Amoco's recent earnings growth and its spending on MIS employees earn it a 40th-place rank among the most effective users of technology nationwide.

Though smaller overall than either Exxon Corp. or Mobil Corp., Amoco is generally acknowledged as a shrewd player when it comes to deploying technology — whether providing timely drilling data to managers out in the oil fields or assessing the exploration potential of the 11.4 million net acres it is about to acquire through the $4 billion acquisition of Dome Petroleum Ltd. in Canada.
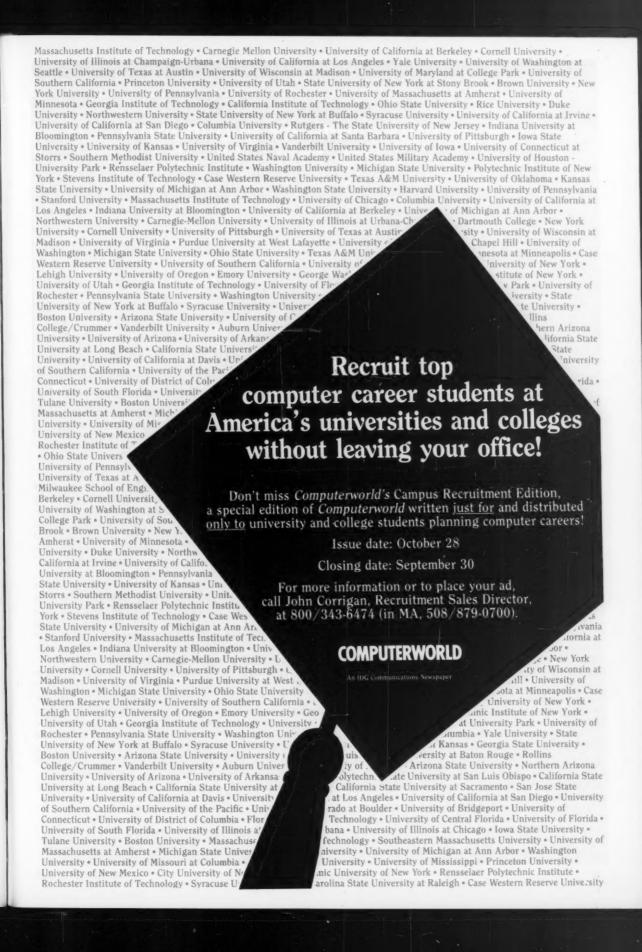
On the upswing

Indeed, Amoco's senior management team strongly backs a wide range of initiatives for improving production profitability and facilitating restructuring efforts in both the upstream — exploration and production — and downstream — refinery management and marketing — sides of its business. Though quantitative results from these initiatives are hard to come by, Amoco's rosy earnings picture in 1987 — when total revenue rose 11% from 1986 — are in part the result of increased operating efficiencies.

Leading Amoco's broad-based information technology initiatives is John R. Reid, general manager of information systems and a 20-year Amoco veteran. Reid says that within Amoco, there is currently an extraordinary amount of pent-up demand on the part of users for systems development support. This demand stems, in large measure, from the downsizing that Amoco and other oil companies have gone through in recent years. With fewer individuals to perform

John Reid, Amoco's general manager of systems

JERRY KALYNIUK

PETROLEUM PRODUCTS

Industry rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	Amoco Corp. Chicago 46,800	40	11,515	$20,174M	$1,360M	$200M
2	Unocal Corp. Los Angeles 18,100	48	11,205	$8,466M	$181M	$125M
3	USX Corp. Pittsburgh 53,500	56	11,010	$13,898M	$219M	$175M
4	Sun Co. Wayne, Pa. 23,100	64	10,830	$8,691M	$348M	$125M
5	Pennzoil Co. Houston 6,200	73	10,600	$1,786M	$44M	$33M
6	Atlantic Richfield Co. Los Angeles 26,200	83	10,385	$16,281.4M	$1,224.3M	$240M
7	Shell Oil Co. Houston 33,184	98	9,925	$20,852M	$1,230M	$200M
8	Tenneco, Inc. Houston 102,500	111	9,565	$15,075M	-$218M	$240M

research and analysis, computerized resources are all the more important.

Significantly, Amoco's subsidiaries — not internal information systems — are driving the demand for technology resources and tools. The subsidiaries' demand for systems services is also attributable to the industry's overall recent earnings patterns. At Amoco, as at its competitors, earnings from upstream exploration and production rebounded strongly in 1987 — a 300% increase over 1986.

Downstream refining, marketing and transportation earnings, which fell by 40% in 1987, earned $206 million in this year's second quarter, compared with $55 million in the same period last year.

So in information systems terms, Amoco is a bull market. Precisely because the demand for support is so widespread throughout the corporation, Reid insists on a highly centralized systems operation to oversee a diverse information technology project base.

An estimated 70% of Amoco's information systems spending occurs through Reid's parent company budget, with the remainder funded through smaller installations at refineries, chemical plants and research facilities.

In the broadest sense, Amoco is using technology to support the restructuring of its main upstream operating subsidiary, Amoco Production Co., which searches for and produces crude oil and natural gas worldwide and eats nearly 50% of Reid's charge-out budget.

This restructuring effort involves integrating and revamping the production revenue accounting area and its database structures.

Amoco Production is also upgrading the technology associated with actual production operations to improve profitability by applying a wide range of advanced technologies, including engineering workstations, high-resolution graphics and software for optimizing the flow of products through gas plants, and monitoring field operations.

In the downstream business, most technology activity centers on one of two large operating subsidiaries, Amoco Oil Co. (the other is Amoco Chemical Co.), which manufactures, transports and markets petroleum products and consumes about 25% of Reid's information systems charge-out budget.

Given Amoco's range of competitive cost-containment and productivity-boosting technology initiatives and its impressive performance as the industry's earnings leader in the first half of 1988, Morrow's claim that the company is positioned to maintain "profitable growth in an uncertain environment" has a ring of truth.

Certainly for the company to meet its long-term earnings growth objective of 8% to 10% per year, information technology can only increase in strategic importance. Reid notes, "I cannot envision a scenario that would cause us to hold flat or decrease information systems spending."

Ultimately, Amoco's success in developing and applying technology solutions to business problems may hinge on a comparatively simple managerial dictum. As Reid puts it, "Information is a commodity. Those who have a lot of it and can rely on it ought to be able to make better business decisions. We must, therefore, invest in systems that make data available to all who need it."

Bernstein is managing director of Gavroche Associates, a communications consulting firm in Cambridge, Mass.

Dave Evans, Penney's systems chief

J. C. PENNEY PROVES ITSELF A SMART SYSTEMS SHOPPER

By Connie Winkler

Any bargain hunter knows you get your money's worth at J. C. Penney Co. Likewise, the company's information systems are the result of investments that provide good value for the dollar.

In other industries, such a philosophy is hardly a qualification for leadership; however, in the retailing arena, where systems investments hover at approximately 1% of revenue, Penney's systems use ranks at the top of the industry in the *Computerworld Premier 100*. The company annually invests almost 1.5% of its $15 billion revenue in information systems.

Penney's no-nonsense philosophy, which hearkens back to the days of founder James Cash Penney, allows the company to make the most of technology to operate 1,400 retail stores nationwide. Information systems support contributes to a $608 million profit, which increased 12% last year. Profits grew 25% the previous year, making up for declines in 1983 and 1984.

"In the past 20 years, we've seen retailing exploit technology more, and we were on the leading edge," says Dave Evans, vice-president of systems and data processing.

"Retailing in general was not as early to exploit computers as insurance and financial services."

Evans took the information systems helm earlier this year when Penney's headquarters moved out of New York's midtown Manhattan to Plano, Texas, outside Dallas. The firm's technological claims to fame include the following:

● Running one of the most sophisticated and far-flung IBM Systems Network Architecture networks.

● Using and promoting electronic data interchange (EDI) as much as or more than competitors.

● Processing its merchandise with optical character recognition tags.

● Shipping catalog orders "faster than any other big guys do."

Charge it

The best example of Penney's extracting the most value from its investment is the company's credit card authorization network, which is one aspect of a corporatewide network installed in the mid-1970s. Today, the network connects approximately 40,000 in-store point-of-sale terminals.

Penney's customers like credit cards: Almost 60% of the company's $15 billion annual sales are from credit, primarily Penney's own cards but also bank cards and American Express.

"Credit authorization became a competitive advantage," Evans says.

About five years ago, Penney realized other retailers, also scattered throughout the U.S., might need fast, accurate credit authorizations. The company formed a separate subsidiary, J. C. Penney System Services, Inc., to offer this service to these retailers.
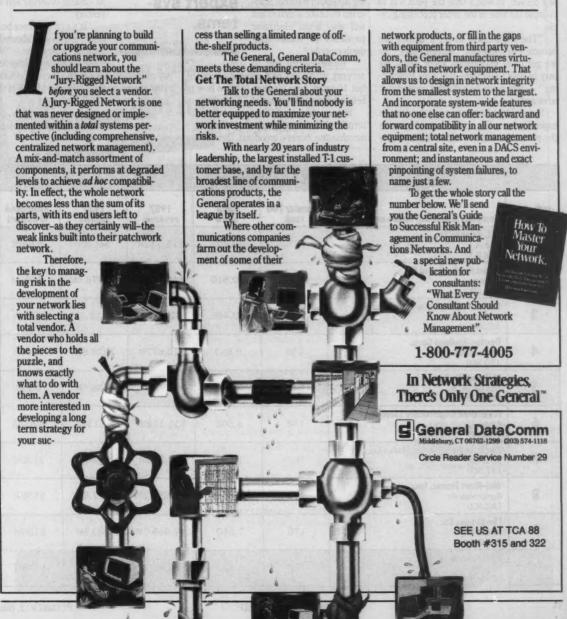
Oil companies with service station chains, such as Sunoco, Amoco, Shell and Unocal, snapped up the offer. The system processes authorizations that travel from the service station to the nearby Penney's store and then to Tandem TXP-class transaction processing systems at three of the company's six data centers.

Lately, other smaller retailers and several Utah banks have been added to the authorization network. Currently, the network handles 350 million Penney authorizations and 300 million others annually, with Penney's own security software guarding network access.

Penney is expanding its services by

handling the billing processing and electronic messaging for several of the gasoline company clients.

"Management is spurring us on to do more things," says Gerry Monday, manager of corporate systems services and data processing. "The key is to move from operational things — creating tickets for warehousing or writing payroll checks, for instance — to getting information about competitive decisions."

Speed is not the issue

This effort stands in sharp contrast with the last decade, at which time the push was to collapse the time in the order processing cycle.

"The requirement to get it quickly has become less important," Monday says. "As we get more information about items, we may be able to do some real sales forecasting" — which can be a distinct competitive advantage.

Some of that forecasting may be done on expert systems-like applications running on the personal computer local-area networks

Penney is installing in buildings on its Plano campus.

Early sales forecasting would address the proverbial problems of too many stylish swimsuits in September or "dog merchandise" — clothes that no one wants at anytime of the year.

Penney's EDI network was installed in the early 1980s, and the company sends its own EDI manual to its 200 largest suppliers who download orders each night. Penney promises to adopt the coming American National Standards Institute standard and will also begin electronic payments as those standards emerge.

"We've learned how to network within our own company over the last 10 years; now it's time to learn how to network between companies," Evans says.

Penney also uses EDI in its ambitious internal television programming. Corporate merchandise buyers broadcast their selec-

Sales forecasting may be done by expert systems.

tions to more than 300 buyers who sit at computers and individually select the fashions they believe will sell in their region — within their budget and sales projections. Their selections are sent to the suppliers electronically. Penney uses a satellite-based Private Television Network for the broadcasts and now operates three studios in Dallas.

Another technology-based ordering operation is Penney's catalog sales, which applies electronically premarked merchandise to its catalog ordering and inventory.

"It's a convenience business," Evans says about the catalog operations. "We make it convenient to order, pay and receive the goods." Penney provides catalog service within 48 hours to 70% of the country.

Winkler, former New York bureau chief for Computerworld, writes about information strategies and management technology.

RETAILING

Industry Rank	Company/Location/Total employees	Premier 100 rank	Total score	1987 revenue	1987 profits	Estimated IS budget
1	**J. C. Penney Co.** Dallas 178,500	67	10,705	$15,332M	$608M	$225M
2	**Sears Roebuck and Co.** Chicago 493,200	74	10,510	$48,440M	$1,498.9M	$600M
3	**Carter Hawley Hale Stores, Inc.** Anaheim, Calif. 35,000	76	10,465	$2,641M	-$115.3M	$40M
4	**Dayton-Hudson Corp.** Minneapolis 130,500	136	8,860	$10,677M	$228.5M	$200M
5	**McDonald's Corp.** Oak Brook, Ill. 159,000	145	8,540	$4,893.5M	$596.5M	$60M
6	**Federated Department Stores** Cincinnati 135,300	148	8,505	$11,118M	$313M	$200M
7	**The May Department Stores Co.** St. Louis 147,400	169	7,840	$10,314M	$444M	$100M
8	**Wal-Mart Stores, Inc.** Bentonville, Ar. 183,000	172	7,635	$15,959.3M	$627.6M	$150M
9	**The Kroger Co.** Cincinnati 170,000	176	7,560	$17,659.7M	$246.6M	$150M
10	**K Mart Corp.** Troy, Mich. 325,000	192	6,820	$25,864M	$692.2M	$125M

◰ BEST OF THE REST

Systems move from an expense to a must in retail

By Sheryl Kay

Sears Roebuck vs. J. C. Penney. Macy's vs. Bloomingdale's. **McDonald's** vs. Burger King. Rivalries dominate retail whether the merchandise is appliances, clothing or fast food.

Yet, because retailers are playing catch-up with other industries in using information technology, they are putting aside their competitive struggles to come together on one mutually beneficial project.

Retailers are joining forces to examine how they can best use technology. The symbol of this cooperative effort is the 2-year-old Voluntary Interindustry Communications Standards (VICS) group.

An ad hoc team of retailers, apparel manufacturers and suppliers work together to establish standards to meet the members' business goals. In addition, VICS recently commissioned Big Eight consulting firm Arthur Andersen & Co. to do a cost-benefit analysis on new technologies in retailing.

The findings will be presented in January 1989 at the Annual National Retail Merchants Association convention in New York, according to Phil Dolen, a consulting practice partner at Arthur Andersen.

Keeping up with the Joneses

"The focus of MIS in retailing today," Dolen explains, "is to reduce the stores' purchasing and replenishment cycle in order to bring what is purchased more in line with trends."

Specific technology used for these purposes, Dolen says, includes bar coding so that every item will bear a unique identification and scanning in order to capture that information with low error rates.

"Leaders in that area include **Wal-Mart**, **K Mart** and **Dayton-Hudson**," he says.

These companies are among the *Computerworld Premier 100* top 10 in retail. Together the 10 companies spend an average of 1.24% of their revenue on information systems — a low average when compared with 4.9% in banking and 4% in transportation and other services.

Systems expenditures are increasing, according to industry analysts, as retailers change their attitudes about the usefulness of technology.

A few years ago, small regional chains dominated the industry. The companies worked on extremely tight margins, and the business philosophy was operations oriented, with the major thrust to streamline delivery of services.

In that light, "MIS was looked upon as an expense item, generally to improve the operation of the retailer," says Glenn Mangurian, a vice-president at Index Group, Inc. in Cambridge, Mass.

Recently, however, the industry has gone through a major transition, with leading companies operating hundreds of outlets across the country.

This change in operating environment demands an upgrade in the role of MIS.

"MIS is allowing the retail executive to know what is happening in his 100 stores, like he used to know in his one store," Dolen observes.

Major marketing tool

"The emphasis is now on using information technology as more of a marketing tool for the merchandising and the buying functions," Mangurian says.

For example, Kathy Spangenberg, director of systems and programming at Mervyn's, one of Dayton-Hudson's operating companies, is responsible for tracking customer interests.

"We are very sensitive to their demands," Spangenberg says, "so we must evaluate the customer's preferences in a very short time frame. It just can't be done manually."

Spangenberg's group provides data on how often customers come into the stores, how long they stay, in which departments they make their purchases and, perhaps most importantly, what it is exactly that a customer purchases — right down to size, color and description.

This information is valuable in determining what merchandise retailers should carry, when they should have it in stock and to whom they should market it.

"Now we are viewed not as an expense but as a strategic investment," Spangenberg says.

Retailers are awakening to the value of technology

P. CHARLES LADOUCEUR

THE PREMIER 100 (ALPHABETICALLY) WITH OVERALL RANK

Abbott Laboratories, 7
AMR (American Airlines), 18
American Cyanamid Co., 37
American Express Co., 51
American International Group, 95
American Standard, Inc., 93
Amoco Corp., 40
AT&T, 17
Atlantic Richfield Co., 83
Banc One Corp., 24
Bankamerica Corp., 46
Baxter Healthcare Corp., 11
Bell Atlantic Corp., 8
Bellsouth Corp., 81
The Boeing Co., 91
Burlington Industries, Inc., 77
Capital Cities/ABC, 88
Carter Hawley Hale Stores, Inc., 76
Caterpillar, Inc., 41
CBS, Inc., 58
Citicorp, 54
The Coca-Cola Co., 84
Contel Corp., 28
Corestates Financial Corp., 49
Corning Glass Works, 42
Deere & Co., 32
Dow Chemical Co., 13
Duke Power Co., 66
Dun & Bradstreet Corp., 63
E. I. Du Pont De Nemours and Co., 52
Eastman Kodak Co., 19
Farmers Group, Inc., 82
Federal Express Corp., 61

First Chicago Corp., 72
First Union Corp., 57
First Wachovia Corp., 97
Ford Motor Co., 86
Gencorp, Inc., 25
General Dynamics Corp., 90
General Electric Co., 38
General Mills, Inc., 100
General Motors Corp., 96
General Signal Corp., 33
Georgia-Pacific Corp., 35
Gillette Co., 6
Goodyear Tire & Rubber Co., 27
GTE Corp., 20
Home Federal Savings & Loan, 70
International Paper Co., 26
J. C. Penney Co., 67
Johnson & Johnson, 71
Litton Industries, 99
The Lockheed Corp., 14
Manufacturers Hanover Corp., 85
McDonnell Douglas Corp., 9
MCI Communications Corp., 10
McGraw-Hill, Inc., 12
The Mead Corp., 16
Merck & Co., 21
Metropolitan Life Ins. Co., 43
Middle South Utilities, Inc., 55
Minnesota Mining & Mfg. Co., 78
Monsanto Co., 59
Mutual Benefit Life Ins. Co., 68
Nationwide Mutual Ins. Co., 30
New York Life Insurance Co., 23
Northeast Utilities, 1

Northrop Corp., 3
Norwest Corp., 29
Owens-Illinois, Inc., 15
Pacific Gas and Electric Co., 92
Pennzoil Co., 73
Pepsico, Inc., 79
Pfizer, Inc., 36
Polaroid Corp., 2
PPG Industries, Inc., 94
Primerica Corp., 65
Reynolds Metals Co., 62
RJR Nabisco, Inc., 75
Rockwell International Corp., 34
Salomon, Inc., 87
Sara Lee Corp., 50
Sears Roebuck and Co., 74
Shell Oil Co., 98
Smith Kline Beckman Corp., 39
Southern Company Services, Inc., 47
Southwestern Bell Corp., 5
St. Paul Companies, Inc., 80
Sun Co., 64
Teachers Ins. & Annuity Assn., 45
Teledyne, Inc., 89
Texas Utilities Co., 22
Textron, Inc., 31
Time, Inc., 60
The Travelers Corp., 4
Unocal Corp., 48
Union Carbide Corp., 69
United Technologies Corp., 44
USX Corp., 56
Wickes Companies, 53

Once the information is gathered, it must be "tagged" to that customer, analyzed and then followed up. Index Group's Mangurian relates a favorite industry example of the pregnant woman who went into Sears and purchased maternity clothes with her credit card.

"In the next month's bill, a small brochure would be enclosed for that woman, describing all of Sears' baby furniture," Mangurian says.

Credit cards used to be the traditional way to track customer purchases. Today, sophisticated point-of-sale systems do it.

"Now retailers such as Sears and Penney's are experimenting with preferred-customer cards, check cashing cards and other ways of identi-

Credit cards used to be the way to track purchases. Today, sophisticated point-of-sale systems do it.

fying who the customer is at the point of sale," Mangurian says.

Some companies offer incentives to customers who use that store's means of identification.

Telecommunications technology is also critical in retail, particularly as a control vehicle for those retail chains with many widely scattered outlets.

The importance of communications also extends beyond the retailer's own walls. The desire to minimize paperwork is causing retailers to make demands on their suppliers to implement electronic data interchange (EDI). The sending and receiving of orders, payments and invoicing is moving from paper to EDI.

Although many retailers continue to use third-party vendors such as General Electric Co.'s Information Services and IBM, others — such as K Mart — are moving toward creating their own EDI systems, Mangurian notes.

Relative to other industries, some may still consider the MIS department's visibility in retailing to be low. Few top MIS executives actually report to the chairman of the board at retail companies.

Nevertheless, retailers are starting to move ahead in technology. Some companies are even currently experimenting with expert systems.

Retailers may not be ready to use such systems to predict the popularity of the miniskirt or the maxiskirt for 1989; however, they will help managers make decisions about inventory.

Kay is a Tampa, Fla.-based business consultant and free-lance writer.

HOW TO CALCULATE YOUR COMPANY'S RANKING

FORMULAS:

To calculate where your company would rank among the Premier 100, use the following formulas:

INSTALLED VALUE

Total current market value of installed equipment: _____

STEP 1 — DIVIDE BY
current revenue:_____

STEP 2 — MULTIPLY BY 100

STEP 3 — Assign the points associated with the range that corresponds to your answer:

0.01 to 0.47 — 30 points; 0.48 to 0.96 — 70 points; 0.97 to 2.2 — 120 points; 2.3 to 3.17 — 140 points; 3.17 to 7 — 150 points; more than 7 — 175 points.

STEP 4 — MULTIPLY BY 15. This is your total score for Installed Value.

ESTIMATED BUDGET

Estimated annual MIS/DP budget for corporation: _____

STEP 1 — DIVIDE BY
current revenue:_____

STEP 2 — MULTIPLY BY 100

STEP 3 — Subtract from the percentage that corresponds to your industry:

Aerospace — 1.4; Chemical — 1.2; Consumer products — 1.5; Electronics — 1.4; Food and beverage — 0.8; Health and pharmaceutical — 1.2; Industrial and auto manufacture — 1.0; Metal and metal products — 1.2; Petroleum and petrochemical — 0.68; Other process industries — 0.68; Banking — 4.5; Life insurance — 1.7; Other insurance and financial services — 3.1; Utilities — 1.3; Retail — 1.0

STEP 4 — Assign the points associated with the range that corresponds to your answer:

-4 to -2 — 50 points; -1 to 0.05 — 70 points; 0.06 to 0.60 — 100 points; 0.60 to 2 — 130 points; 2.1 to 2.85 — 140; 2.85 to 6 — 150 points; more than 6 — 175 points.

STEP 5 — MULTIPLY BY 30. This is your total score for Estimated Budget.

PROFIT

STEP 1 — Calculate your corporation's average profit growth over five years (1983 to 1987). If you show negative profits for any year, mark zero points for this category.

STEP 2 — Assign the points associated with the range that corresponds to your answer:

-4 to -2 — 50 points; -1 to 0.05 — 70 points; 0.06 to 0.60 — 100 points; 0.60 to 2 — 130 points; 2.1 to 2.85 — 140; 2.85 to 6 — 150 points; more than 6 — 200 points.

STEP 3 — MULTIPLY BY 15. This is your total score for Profit.

STAFF

STEP 1 — Calculate percentage of current MIS/DP budget spent on staff: _____

STEP 2 — Assign the points associated with the range that corresponds to your answer:

70 to 50 — 70 points; 51 to 40 — 100 points; 41 to 35 — 150 points; 36 to 20 — 170 points; less than 20 — 200 points.

STEP 3 — MULTIPLY BY 15. This is your total score for Staff.

TRAINING

STEP 1 — Calculate percentage of current MIS/DP budget spent on training and education:_____

STEP 2 — Assign the points associated with the range that corresponds to your answer:

70 to 50 — 70 points; 51 to 40 — 100 points; 41 to 35 — 150 points; 36 to 20 — 170 points; less than 20 — 200 points.

STEP 3 — MULTIPLY BY 15. This is your total score for Training.

PCs AND TERMINALS

Total number of personal computers and terminals: _____

STEP 1 — DIVIDED BY
Total corporate employees: _____

STEP 2 — Assign the points associated with the range that corresponds to your answer:

70 to 50 — 70 points; 51 to 40 — 100 points; 41 to 35 — 150 points; 36 to 20 — 170 points; less than 20 — 200 points.

STEP 3 — MULTIPLY BY 15. This is your total score for Personal Computers and Terminals.

FINAL SCORE

ADD POINT TOTALS FROM Value, Budget, Profit, Staff, Training and PCs and Terminals. This is your CW 100 score. Send this information to Mike Sullivan-Trainor, Special Projects Editor, *Computerworld*, 375 Cochituate Road, Framingham, Mass. 01701 to be ranked on next year's list.

FOOTNOTES TO THE 100

Companies with multiple industry affiliations are placed in one of the following categories based on the industry from which they receive the greatest revenue — Aerospace, automotive and industrial; Banking; Chemicals; Equipment and material manufacture; Food, pharmaceuticals and consumer products; Insurance and financial services; Petroleum products; Retailing; Transportation, communication and other services; and Utilities.

Industry average spending on information systems is derived from annual consultant surveys and the average spending of the Premier 100 industry segment.

Insurance company revenue is based on premium income.

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